DEVELOPING A STATE WATER PLAN

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1986

by

James L. Mason and others

United States Geological Survey

Prepared by the United States Geological Survey
in cooperation with the State of Utah

Published by
Division of Water Resources
Utah Department of Natural Resources

Cooperative Investigations Report Number 26
1986

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CONVERSION FACTORS

Most values in this report are given in inch-pound units. Conversion factors to metric units are shown below.

Multiply	By	To obtain
Acre-foot	1233	Cubic meter
Foot	0.3048	Meter
Inch	25.40	Millimeter
Mile	1.609	Kilometer

Chemical concentration is given only in metric units--milligrams per liter. For concentrations less than 7,000 milligrams per liter, the numerical value is about the same as for concentrations in parts per million.

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INTRODUCTION

This is the twenty-third in a series of annual reports that describe ground-water conditions in Utah. Reports in the series, prepared cooperatively by the U.S. Geological Survey and the Utah Division of Water Resources, provide data to enable interested parties to keep abreast of changing ground-water conditions.

This report, like the others in the series, contains information on well construction, ground-water withdrawals from wells, water-level changes, and related changes in precipitation and streamflow. Supplementary data such as graphs showing chemical quality of water and maps showing water-level contours are included in reports of this series only for those years or areas for which applicable data are available and are important to a discussion of changing ground-water conditions.

The report includes individual discussions of selected major areas of ground-water development in the State for the calendar year 1985. Water-level fluctuations, however, are described for spring 1985 to spring 1986. Much of the data used in the report were collected by the Geological Survey in cooperation with the Division of Water Rights, Utah Department of Natural Resources.

The following reports dealing with ground water in the State were released or printed by the Geological Survey during 1985:

Ground-water conditions in Utah, spring of 1985, Ralph L. Seiler and others, Utah Division of Water Resources Cooperative Investigations Report 25.

Bedrock aquifers of Eastern San Juan County, Utah, Charles Avery, Utah Department of Natural Resources Technical Publication 86 (in press).

Ground-water conditions in the Lake Powell area, Utah, Paul J. Blanchard, Utah Department of Natural Resources Technical Publication 84 (in press).

Water resources of the Park City area, Utah, with emphasis on ground water, Walter F. Holmes, Kendall R. Thompson, and Michael Enright, Utah Department of Natural Resources Technical Publication 85 (in press).

Physical characteristics and chemical quality of selected springs in parts of Juab, Millard, Tooele, and Utah Counties, Utah, D. E. Wilberg and B. J. Stolp, Water Resources Investigations Report 85-4324.

Ground water in Utah--A summary of the resource and its related physical environment, Don Price and Ted Arnow, Utah Department of Natural Resources Water Circular 3.

Selected test-well data from the MX-missile siting study, Tooele, Juab, Millard, Beaver, and Iron Counties, Utah, J. L. Mason, J. W. Atwood, P. S. Buettner, Utah Hydrologic-Data report 43.

The ground-water system and simulated effects of ground-water withdrawals in northern Utah Valley, Utah, D. W. Clark, Water Resources Investigations Report 85-4007.

Simulation analysis of water-level changes in the Navajo Sandstone due to changes in the altitude of Lake Powell near Wahweap Bay, Utah and Arizona, B. E. Thomas, Water Resources Investigations Report 85-4207.

UTAH'S GROUND-WATER RESERVOIRS

Small quantities of ground water can be obtained from wells throughout much of Utah, but large supplies that are of suitable chemical quality for irrigation, public supply, or industrial use generally can be obtained only in specific areas. The major areas of ground-water development discussed in this report are shown in figure 1 and named in table 1. Relatively few wells outside of these areas yield large supplies of water of good chemical quality for the uses listed above, although some of the basins in western Utah and many areas in eastern Utah have not been explored sufficiently to determine their potential for ground-water development.

About 2 percent of the wells in Utah obtain water from consolidated rocks. The consolidated rocks that yield the most water are lava flows, such as basalt, which contain interconnected vesicular openings or fractures; limestone, which contain fractures or other openings enlarged by solution; and sandstone, which contains open fractures. Most of the wells that tap consolidated rocks are in the eastern and southern parts of the State in areas where water supplies cannot be obtained readily from unconsolidated rocks.

About 98 percent of the wells in Utah draw water from unconsolidated rocks. These rocks may consist of boulders, gravel, sand, silt, or clay, or a mixture of some or all of these materials. Wells obtain the largest yields from the coarser materials that are sorted into deposits of uniform grain size. Most wells that tap unconsolidated rocks are in large intermountain basins, which have been partly filled with rock material eroded from the adjacent mountains.

SUMMARY OF CONDITIONS

The estimated total withdrawal of water from wells in Utah during 1985 was about 733,000 acre-feet, which is about 110,000 acre-feet more than during 1984 and about 49,000 acre-feet less than the average annual withdrawal for 1975-84 (table 2). The majority of the increase in withdrawal was due to an increase in withdrawal for irrigation. Withdrawal for irrigation was 427,000 acre-feet (table 2), which is 89,000 acre-feet more than the revised estimate for 1984. Withdrawal for industry was 80,000 acre-feet, which is 6,000 acre-feet less than reported in 1984. Total withdrawal for public supply was 159,000 acre-feet, which is 21,000 acre-feet more than during 1984. Withdrawal for domestic and stock use was 69,000 acre-feet, which is 9,000 acre-feet more than during 1984.

The quantity of water withdrawn from wells is related to demand and availibility of water from other sources, which in turn is related to local climatic conditions. Precipitation in most of Utah during 1985 was closer to normal than during the past 3 years, although still generally above average (National Oceanic and Atmospheric Administration, 1986). Of the 32 weather stations for which graphs of cumulative departure from average annual precipitation are included in this report, 9 stations recorded below the average annual amount, in contrast to the 0 to 5 stations that recorded below-average precipitation during 1982-84. This was the fourth consecutive year of generally above average precipitation in Utah. The largest departures, which were more than 5 inches

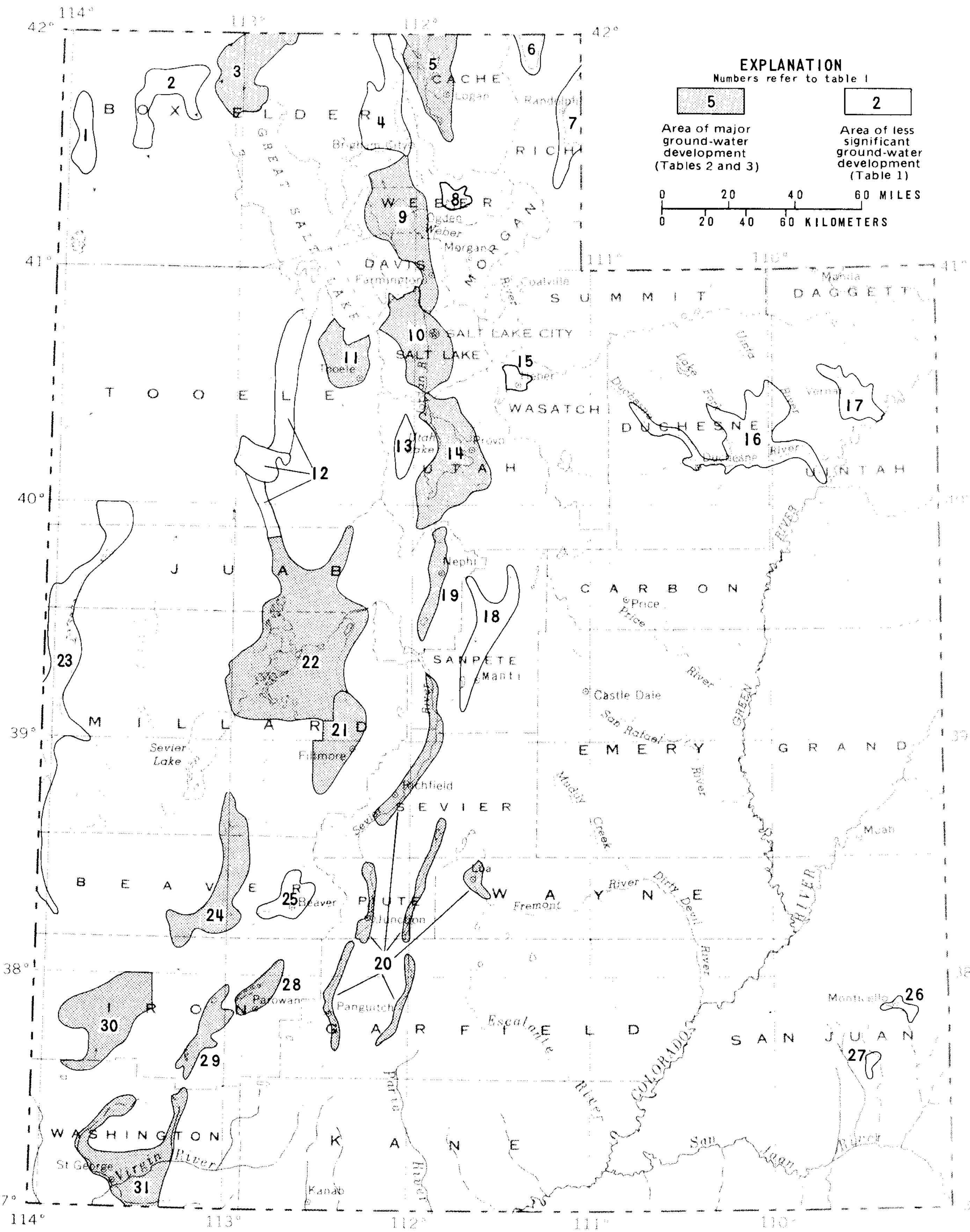


Figure 1.—Areas of ground-water development specifically referred to in this report.

Table 1.--Areas of ground-water development in Utah specifically referred to in this report

Number in figure 1	Area	Principal type of water-bearing rocks
1	Grouse Creek Valley	Unconsolidated
2	Park Valley	Do.
3	Curlew Valley	Unconsolidated and consolidated
4	Malad-lower Bear River valley	Unconsolidated
5	Cache Valley	Do.
6	Bear Lake valley	Do.
7	Upper Bear River valley	Do.
8	Ogden Valley	Do.
9	East Shore area	Do.
10	Salt Lake Valley	Do.
11	Tooele Valley	Do.
12	Dugway area	Do.
	Skull Valley	Do.
	Old River Bed	Do.
13	Cedar Valley	Do.
14	Utah and Goshen Valleys	Do.
15	Heber Valley	Do.
16	Duchesne River area	Unconsolidated and consolidated
17	Vernal area	Do.
18	Sanpete Valley	Unconsolidated
19	Juab Valley	Do.
20	Central Sevier Valley	Do.
	Upper Sevier Valleys	Do.
	Upper Fremont River valley	Unconsolidated and consolidated
21	Pahvant Valley	Do.
22	Sevier Desert	Unconsolidated
23	Snake Valley	Do.
24	Milford area	Do.
25	Beaver Valley	Do.
26	Monticello area	Consolidated
27	Blanding area	Do.
28	Parowan Valley	Unconsolidated and consolidated
29	Cedar City Valley	Unconsolidated
30	Beryl-Enterprise area	Do.
31	Central Virgin River area	Unconsolidated and consolidated

Table 2.--Well construction and withdrawal of water from wells in Utah

Number of wells constructed in 1985.--Data provided by Utah Department of Natural Resources, Division of Water Rights. Includes deepened and replacement wells.
Diameter of 6 inches or more.--Constructed for irrigation, industry, or public supply.
Estimated withdrawals from wells.--
1984 total: From Seiler and others (1985, table 2) includes some unpublished revisions.
1975-84 average annual: Calculated from previous reports of this series and also includes some previously unpublished revisions.

Area	Number in figure 1	Number of wells constructed in 1985: Total	Number of wells constructed in 1985: Diameter of 6 inches or more	Estimated withdrawals from wells (acre-feet), 1985: Irrigation	1985: Industry	1985: Public supply	1985: Domestic and stock	1985: Total (rounded)	1984 total	1975-84 average annual
Curlew Valley	3	0	0	26,700	0	20	50	27,000	20,000	27,000
Cache Valley	5	23	3	9,900	6,150	3,900	1,800	22,000	21,000	26,000
East Shore area	9	27	5	[1]23,900	9,700	29,700	4,000	67,000	49,000	42,000
Salt Lake Valley	10	107	21	3,900	[2]12,100	69,100	25,300	110,000	102,000	117,000
Tooele Valley	11	18	3	[1]18,300	1,130	1,350	250	21,000	23,000	28,000
Utah and Goshen Valleys	14	26	18	36,900	10,300	20,500	20,000	88,000	78,000	97,000
Juab Valley	19	0	0	9,500	0	[3]1,500	300	11,000	6,000	19,000
Sevier Desert	22	24	2	9,800	1,600	980	300	13,000	10,000	26,000
Upper and central Sevier Valleys and upper Fremont River valley	20	28	6	11,000	300	4,100	5,500	21,000	20,000	24,000
Pahvant Valley	21	3	1	62,000	100	350	300	63,000	[4]42,000	79,000
Cedar City Valley	29	5	5	20,100	900	1,600	400	23,000	20,000	29,000
Parowan Valley	28	4	2	[5]24,500	300	300	200	25,000	22,000	28,000
Escalante Valley										
Milford area	24	3	0	42,500	0	800	250	44,000	32,000	55,000
Beryl-Enterprise area	30	16	14	79,300	[6]19,100	560	750	100,000	95,000	84,000
Central Virgin River area[7]	31	2	1	10,400	1,500	8,500	250	21,000	19,000	19,000
Other areas[8]		251	104	38,100	16,900	16,100	6,200	77,000	64,000	82,000
Totals (rounded)		537	185	427,000	80,000	159,000	69,000	733,000	623,000	782,000

1 Includes some domestic and stock use.
2 Includes some use for air conditioning which is reinjected into the aquifer.
3 Includes some industrial use.
4 Previously unreported revision.
5 Includes some use for stock.
6 Includes 19,000 acre-feet pumped to dewater a mine and used as recharge in adjacent area.
7 Prior to 1984 included under "Other Areas".
8 Withdrawals are estimated minimum amounts.

above the average annual precipitation, were recorded at Fillmore and Spanish Fork.

Due to generally closer to normal precipitation than in the preceding 3 years, ground-water withdrawals for 1985 were 18 percent greater than the withdrawals for 1984, but were 6 percent less than the 1975-84 average annual withdrawals. Withdrawals for 1985 were less than the 1975-84 average annual withdrawals in 12 of the 16 areas specifically referred to in this report (table 2). Ground-water levels in most of the State had only minor changes from spring of 1985 to spring of 1986. Water levels declined slightly in most areas due to increased ground-water withdrawals since 1984. In a few areas, water levels have risen slightly where withdrawals have not increased significantly. However, in local areas where precipitation was much above the average annual precipitation, recharge to the ground-water reservoirs continued to be large, such as in Pahvant and Tooele Valleys. This resulted in large water-level rises in local areas where, in addition, ground-water withdrawals have remained small due to the availibility of surface water. Continued withdrawals in the Beryl-Enterprise area of Escalante Valley have resulted in a continued decline of water levels in most of that area.

The total number of wells drilled during 1985 (table 2), as indicated by well-drillers' reports filed with the Utah Division of Water Rights, was about 15 percent more than reported for 1984. The number of large-diameter wells, which are constructed mostly for public supply, irrigation, and industrial use, was more than three times the number reported for 1984.

The large ground-water basins and those experiencing most of the ground-water development in Utah are shown on figure 1. Information about the number of wells constructed, withdrawals of water from wells for principal uses, and total withdrawals during 1985 for the major areas of ground-water development is presented in table 2. For comparison, total withdrawals during 1984 and average annual withdrawals for 1975-84 also are shown in table 2. Annual withdrawals from the major areas of ground-water development for 1975-84 are shown in table 3.

Table 3.--Total annual withdrawal of water from wells in major areas of ground-water development in Utah, 1975-84

[From previous reports of this series.]

Area	Number in figure 1	Thousands of acre-feet									
		1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Curlew Valley	3	21	27	31	27	29	30	40	26	18	20
Cache Valley	5	25	27	32	26	28	25	33	26	20	21
East Shore area	9	38	37	48	36	46	45	36	38	43	49
Salt Lake Valley	10	116	116	113	120	125	129	127	115	110	102
Tocele Valley	11	29	30	28	30	30	27	30	26	22	23
Utah and Goshen Valleys	14	98	107	118	104	107	94	101	86	74	78
Juab Valley	19	25	29	29	19	21	15	21	16	6	6
Sevier Desert	22	26	34	50	40	45	13	18	16	8	10
Upper and central Sevier Valleys and upper Fremont River valley	20	24	25	26	26	24	24	25	28	21	20
Pahvant Valley	21	98	95	117	88	86	75	80	69	42	[1]42
Cedar City Valley	29	28	37	40	31	32	28	29	28	21	20
Parowan Valley	28	28	34	33	29	30	28	27	25	22	22
Escalante Valley											
Milford area	24	60	65	65	58	49	61	69	55	39	32
Beryl-Enterprise area	30	85	79	81	71	79	71	93	99	86	95
Central Virgin River area[2]	31	13	17	18	20	20	20	22	27	16	19
Other areas		66	89	108	92	92	70	83	100	52	64
Totals		780	848	937	817	843	755	834	780	600	623

[1] Previously unpublished revision.
[2] Prior to 1984 included under "Other Areas".

MAJOR AREAS OF GROUND-WATER DEVELOPMENT

Curlew Valley

by G. J. Smith

Withdrawal of water from wells in Curlew Valley in 1985 was approximately 27,000 acre-feet, an increase of 7,000 acre-feet from the amount reported for 1984 and equal to the average annual withdrawal for 1975-84 (table 2). The increase was due to increased withdrawals for irrigation in 1985.

Water levels in Curlew Valley generally declined in irrigated areas and rose in all other areas from March 1985 to March 1986 (fig 2). All water-level changes were less than 3 feet.

The relation of water levels in two selected observation wells to cumulative departure from average annual precipitation at Snowville and annual withdrawals from wells is shown in figure 3. Well (B-14-9)7bbb-1 is representative of the irrigated areas near Snowville and its hydrograph shows a general decline in water level from 1955 to 1982. Despite a slight decline from March 1985 to March 1986, the water level has risen from the 1982 level. Well (B-12-11)16cdc-1 is on the outskirts of the irrigated area near Kelton. Its hydrograph shows the same general trend as near Snowville. Precipitation at Snowville in 1985 was 10.89 inches, 1.65 inches below the average annual precipitation for 1941-85.

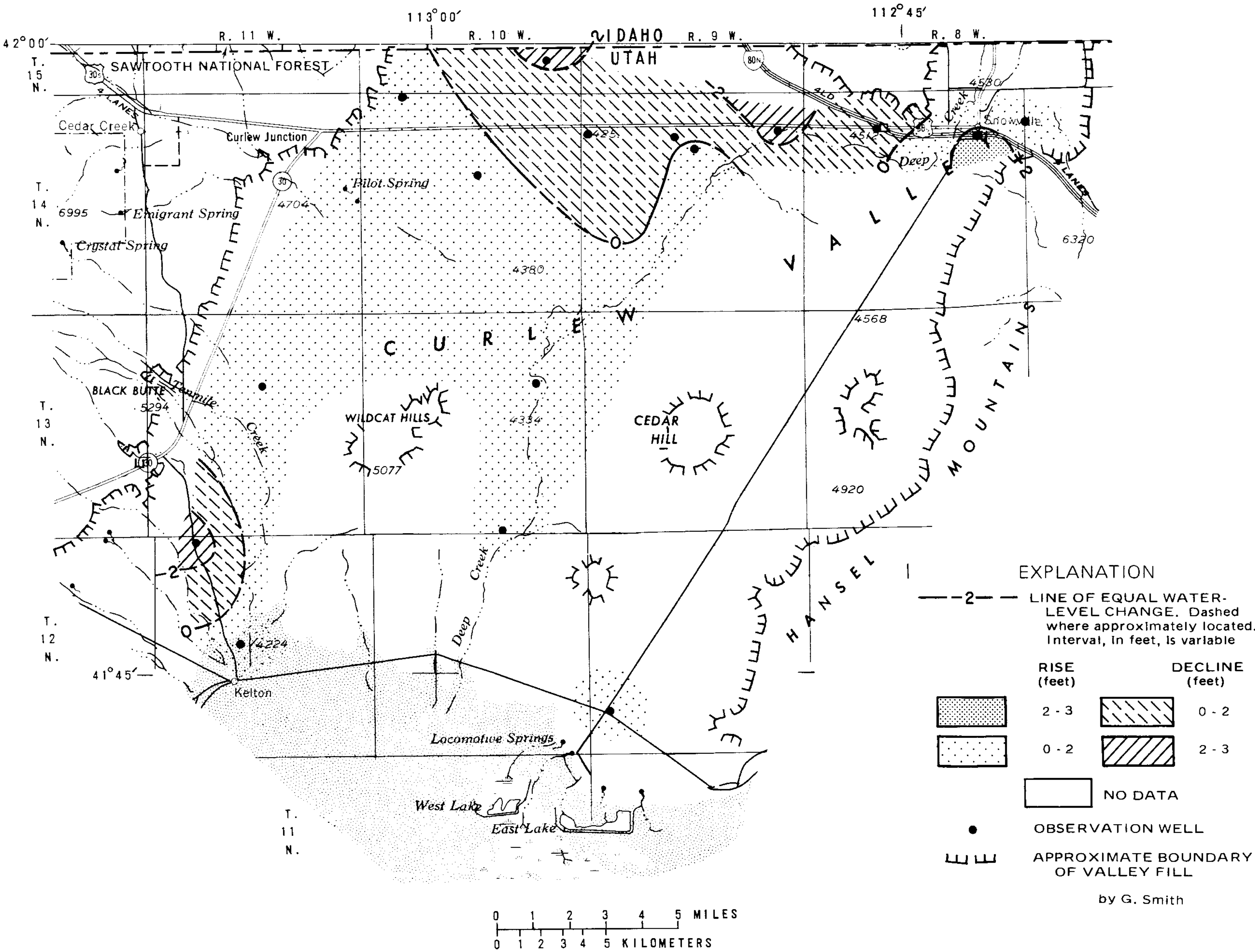


Figure 2.—Map of Curlew Valley showing change of water levels from March 1985 to March 1986.

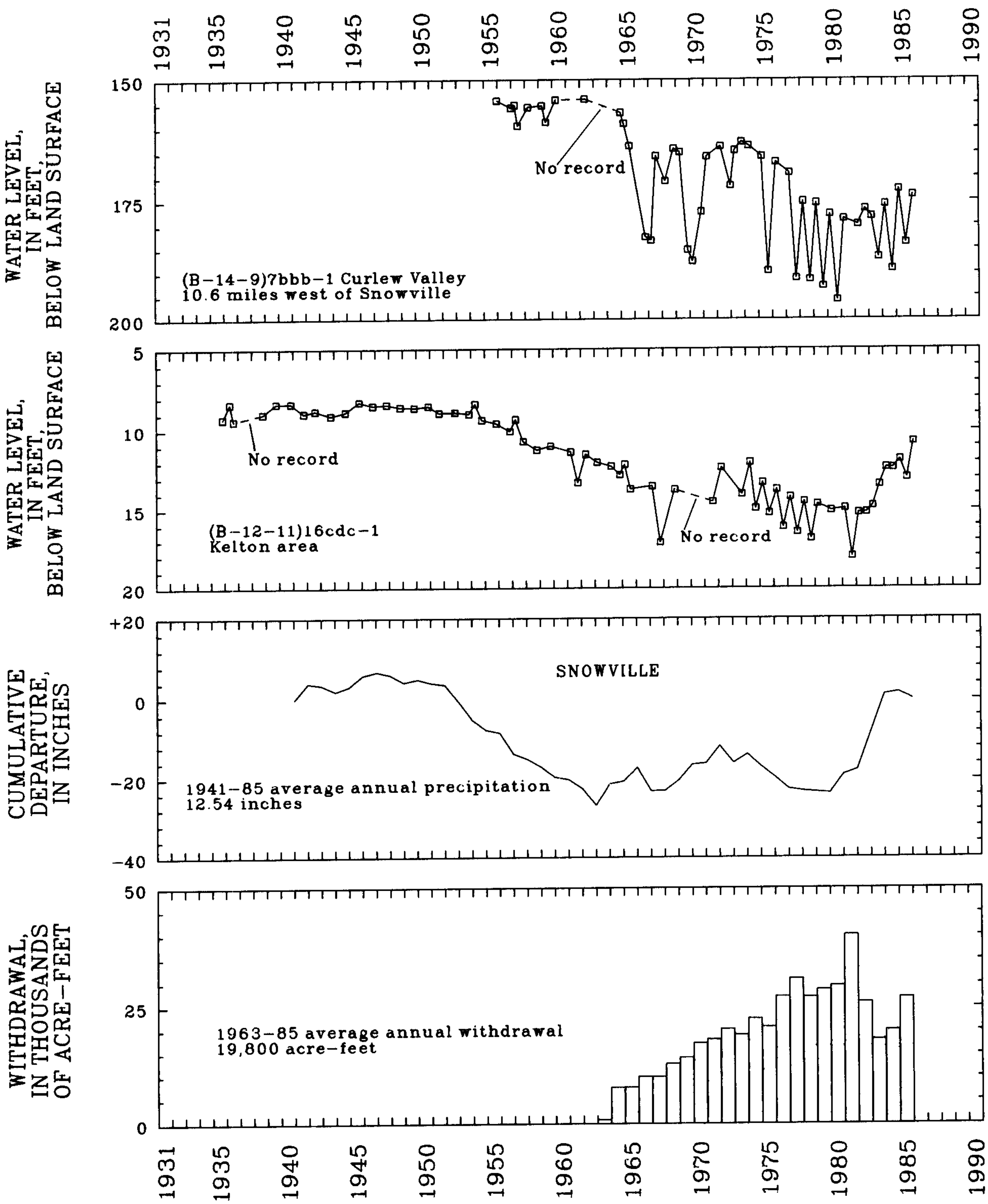


Figure 3.—Relation of water levels in selected wells in Curlew Valley to cumulative departure from the average annual precipitation at Snowville and to annual withdrawals from wells.

CACHE VALLEY

By D. Michael Roark

Approximately 22,000 acre-feet of water was withdrawn from wells in Cache Valley in 1985. This was 1,000 acre-feet more than the amount withdrawn in 1984 and 4,000 acre-feet less than the average annual withdrawal for 1975-84 (table 2). The increase from 1984 was due to increased withdrawal for irrigation and public supply. Discharge of the Logan River during 1985 was 187,000 acre-feet, which is 119,000 less than during 1984 and 101 percent of the 1941-85 average annual discharge.

Water levels from March 1985 to March 1986 rose in the northern half and the southern tip of the valley (fig. 4). Water levels declined in most of the southern half of the valley with the greatest declines, from 4 to 7 feet, occuring near the mountains on the southeast side of the valley near Logan.

The long-term trend of the water levels in well (A-12-1)29cab-1, annual discharge of the Logan River near Logan, cumulative departure from the annual precipition at Logan, Utah State University, and annual withdrawals from wells are shown in figure 5. Annual precipitation of 19.79 inches in 1985 was 0.99 inches above the 1941-85 average.

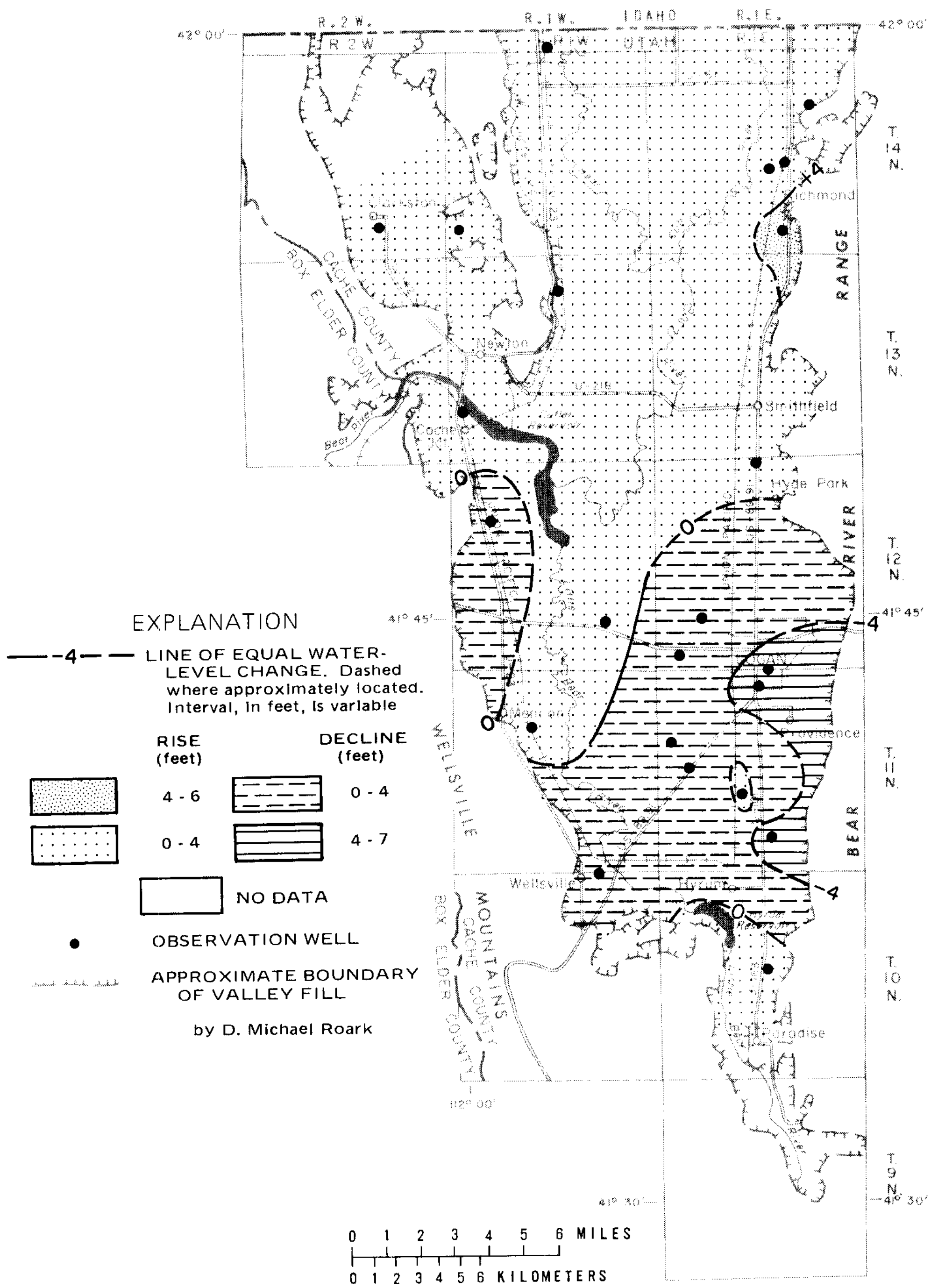


Figure 4.—Map of Cache Valley showing change of water levels from March 1985 to March 1986.

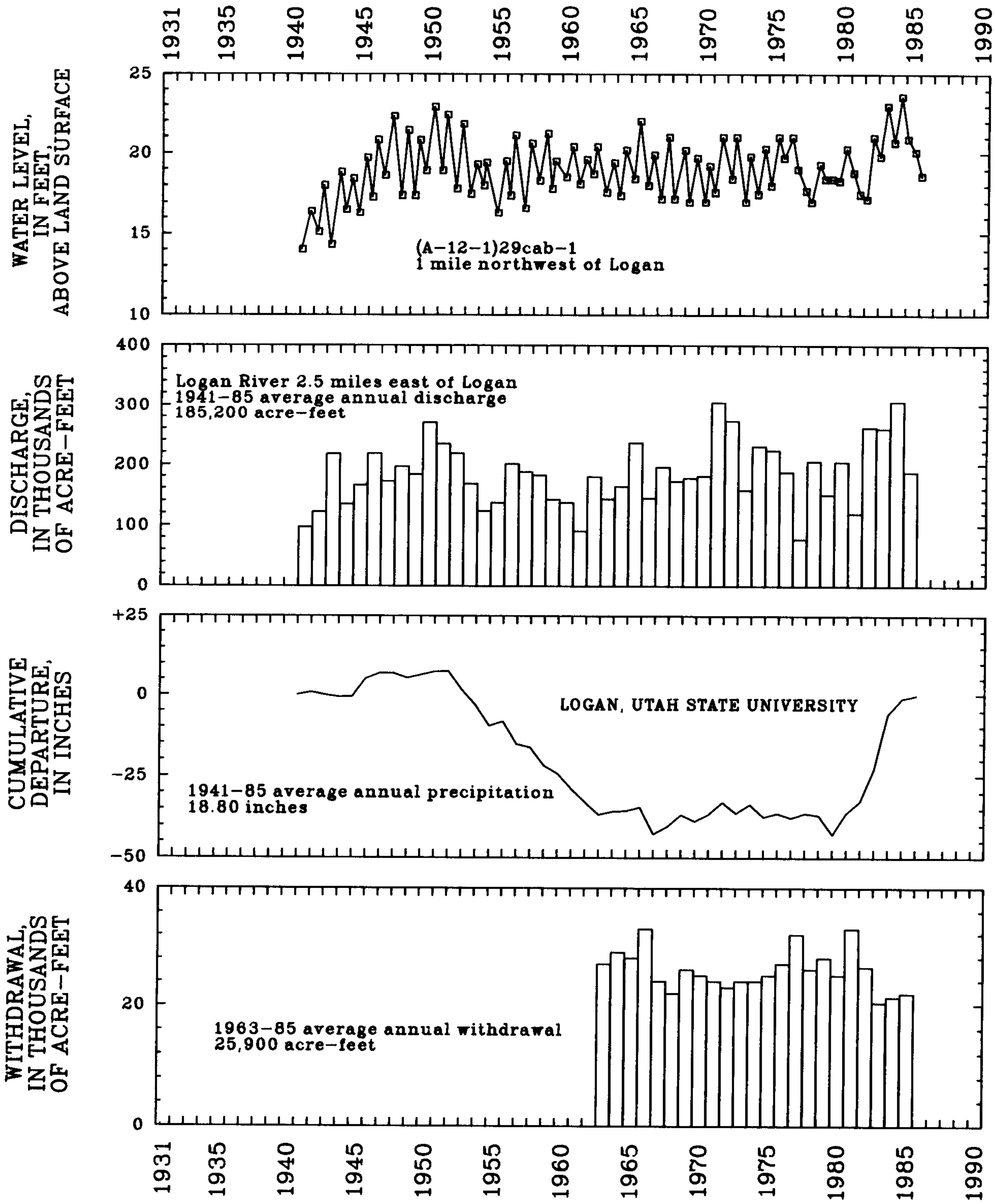


Figure 5.—Relation of water levels in well (A-12-1)29cab-1 in Cache Valley to discharge of the Logan River near Logan, to cumulative departure from the average annual precipitation at Logan, Utah State University, and to annual withdrawals from wells.

EAST SHORE AREA

By Patrick M. Lambert

Withdrawal of water from wells in the East Shore area in 1985 was about 67,000 acre-feet, 18,000 acre-feet more than reported for 1984 (table 2). The large increase in withdrawal primarily was due to changes in estimating total discharge from flowing wells. The 1985 withdrawal from flowing wells was estimated to be 23,000 acre-feet, which was determined by a reevaluation of total flowing-well discharge. The 1985 estimate was based on data from 250 wells, whereas the 1984 estimated value of 11,200 acre-feet was based on data from 27 wells. Due to this large adjustment of estimated withdrawal from flowing wells, the total-withdrawal values for 1985 and previous years are not comparable. Withdrawal for domestic and stock use from nonflowing wells was estimated to be 4,000 acre-feet. Total withdrawal for public supply and industry increased about 2,500 acre-feet.

Water levels declined in most of the East Shore area from March 1985 to March 1986 (fig. 6) due to less than normal recharge from below average precipitation and continued increases in withdrawals for public supply and industrial use. Declines of 5 to 10 feet occured in much of the recharge area, and declines of 10 to 17 feet occured locally north of Ogden and Farmington. The large declines north of Ogden are due to below average precipitation combined with continued ground-water withdrawals for public supply and industry. In part of the discharge area, rises of as much as 5 feet occured where declines were observed in the spring of 1985.

The long-term relation of water levels in selected observation wells to precipitation at the Ogden Pioneer Powerhouse and total ground-water withdrawal from wells is shown in figure 7. The 1985 precipitation at the Ogden Pioneer Powerhouse was 17.49 inches or 4.30 inches below the average annual precipitation for 1937-85 at that site. Water-level declines in the observation wells reflect the effect of this below average precipitation.

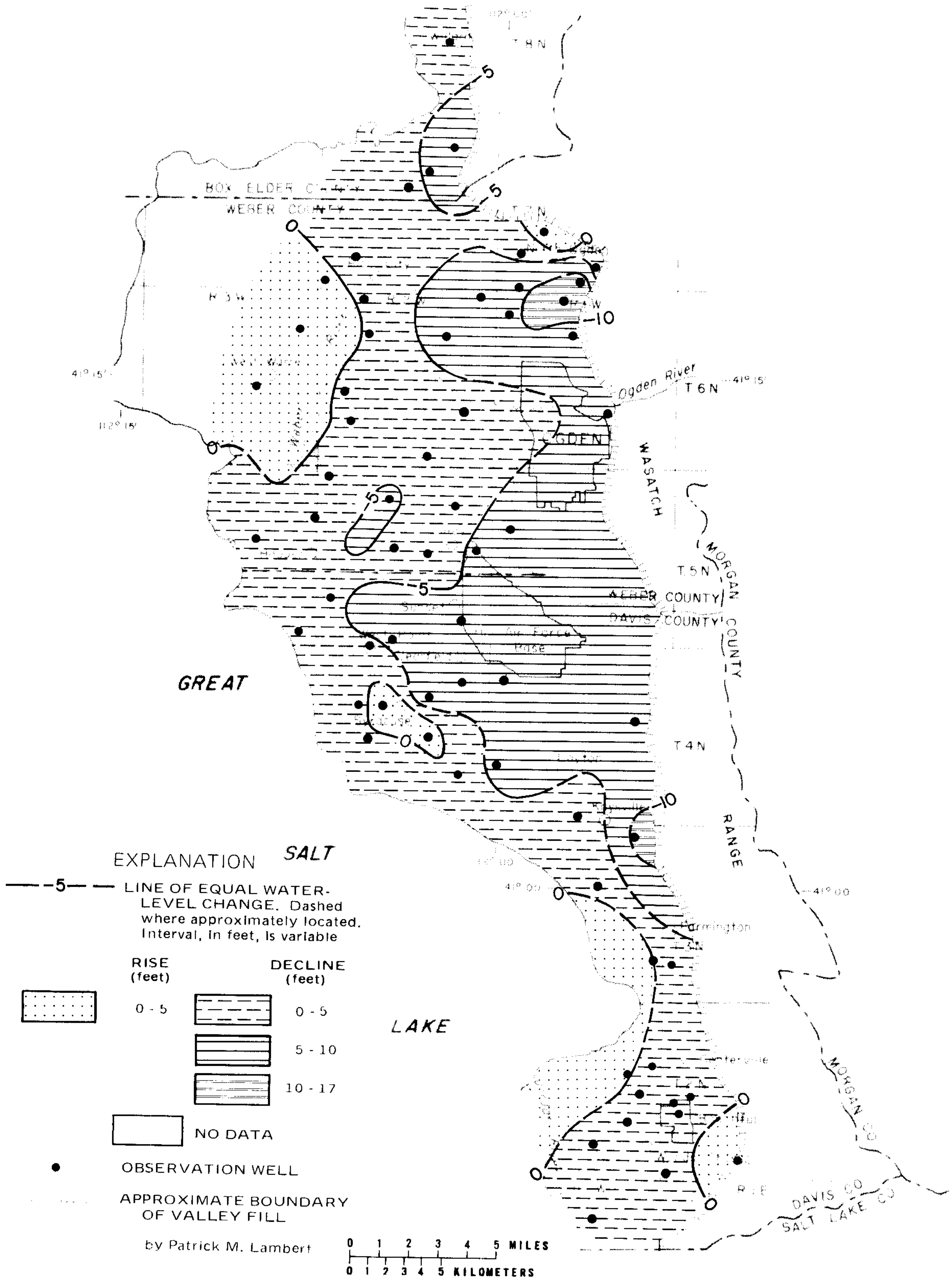


Figure 6.—Map of the East Shore area showing change of water levels from March 1985 to March 1986.

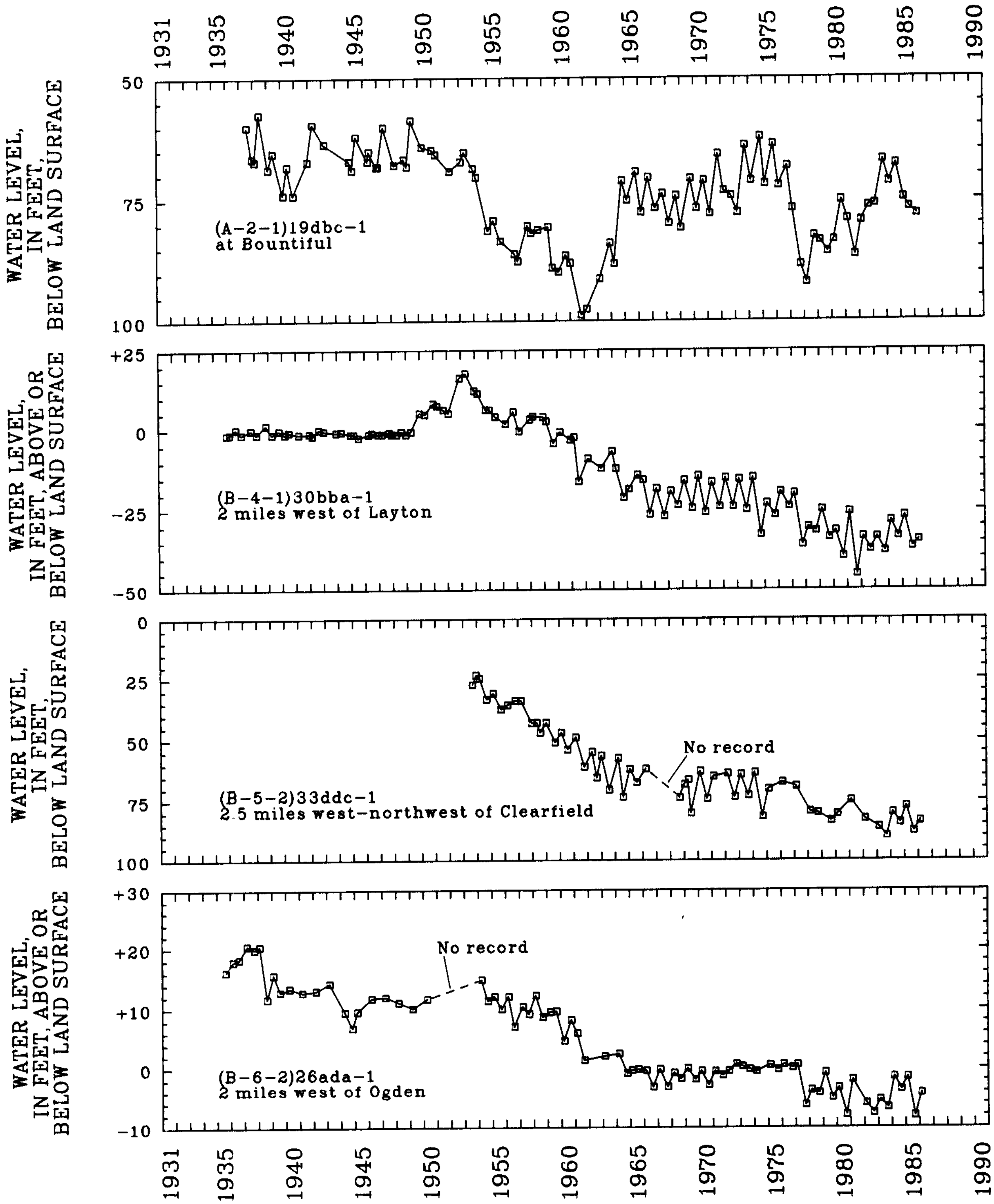


Figure 7.—Relation of water levels in selected wells in the East Shore area to cumulative departure from the average annual precipitation at Ogden Pioneer Powerhouse and to annual withdrawals from wells.

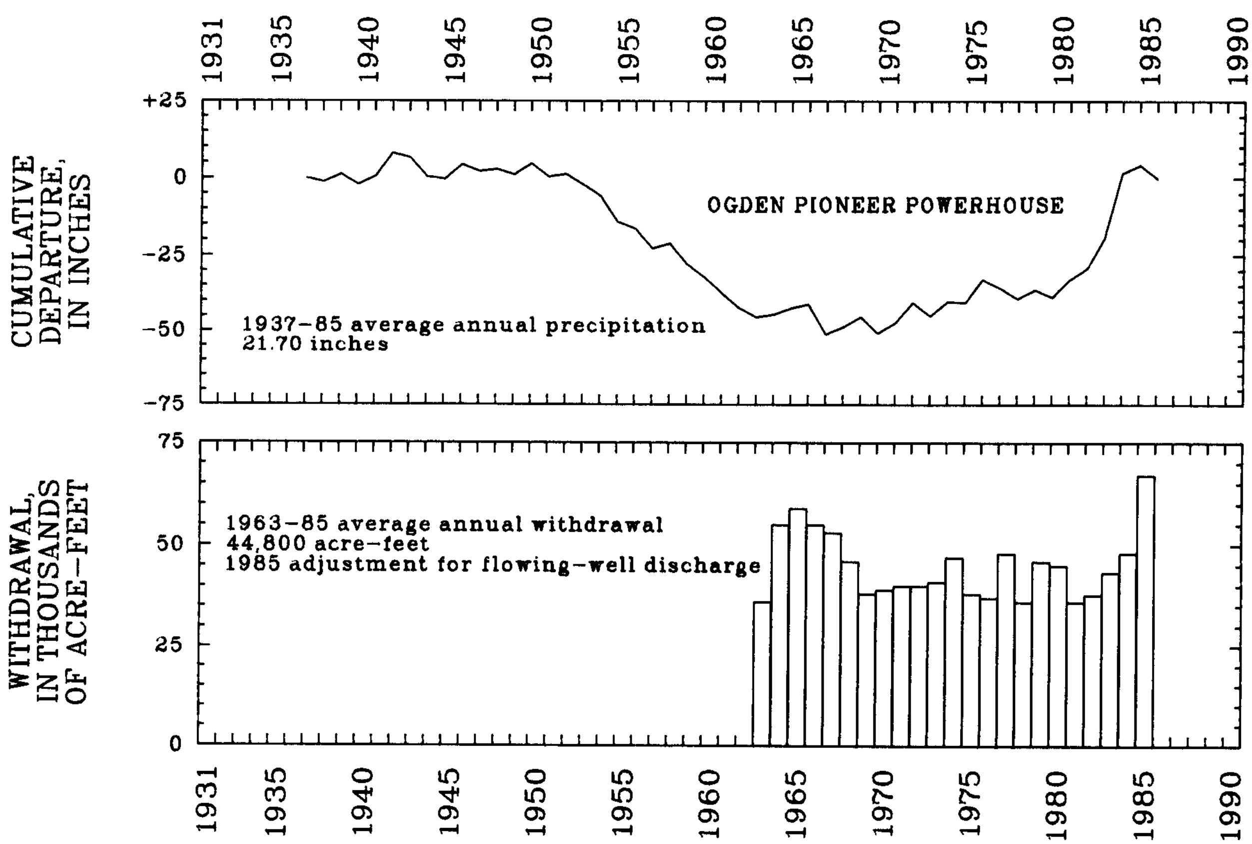


Figure 7.—Continued

SALT LAKE VALLEY

by V. L. Jensen

Withdrawal of water from wells in Salt Lake Valley in 1985 was about 110,000 acre-feet, or about 8,000 acre-feet more than in 1984 and 7,000 acre-feet less than the average annual withdrawal for 1975-84 (table 2). Withdrawal for public supply was 69,100 or about 12,700 acre-feet more than the value for 1984. Withdrawal for industrial use decreased 7,100 acre-feet from 1984, primarily due to reduced withdrawals for the copper industry.

Water levels in the principal aquifer declined in most parts of the Salt Lake Valley from February 1985 to February 1986 (fig. 8). The largest decline, nearly 18 feet, was measured in a well on the east side of Salt Lake City. Rises generally occurred in the central part of the valley. The largest rise, nearly 17 feet, occurred in a well northeast of Kearns.

The relation of water levels and chloride concentration in selected observation wells in the principal aquifer to precipitation, total-annual and public-supply withdrawals from wells, and population are shown in figures 9 and 10. Precipitation at Silver Lake in Brighton was 45.68 inches, 2.66 inches above the average annual precipitation for 1931-85; and precipitation at the Salt Lake City WSO (International Airport) was 16.97 inches, 1.70 inches above the average annual precipitation for 1931-85. The concentration of chloride in the water from well (D-1-1)7abd-6 doubled from 1965 to 1985, although water levels in the general area show a rising trend for the same period. Waddell and others (1986, p. 11) state that the increase in the concentration of chloride may be due to the storage and use of road salt in the recharge areas and in the canyons of the Wasatch Range.

Water levels in selected observation wells in the shallow water-table aquifer in the northwest part of the valley are shown in figure 11. Water levels in February and March 1986 were approximately at the same level as in 1985. The highest water levels in the shallow aquifer usually is in February or March after recharge from snowmelt on the valley floor.

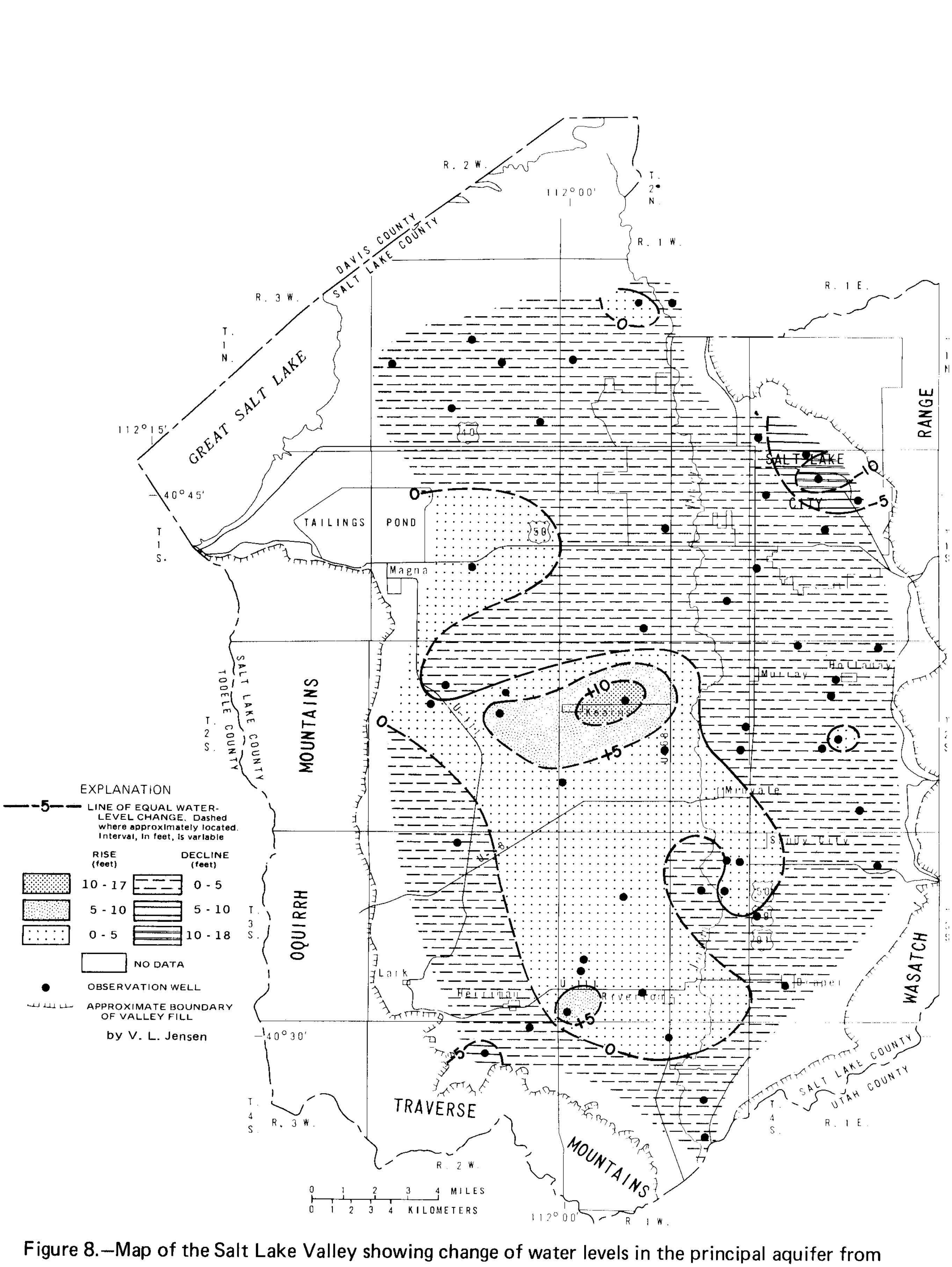


Figure 8.—Map of the Salt Lake Valley showing change of water levels in the principal aquifer from February 1985 to February 1986.

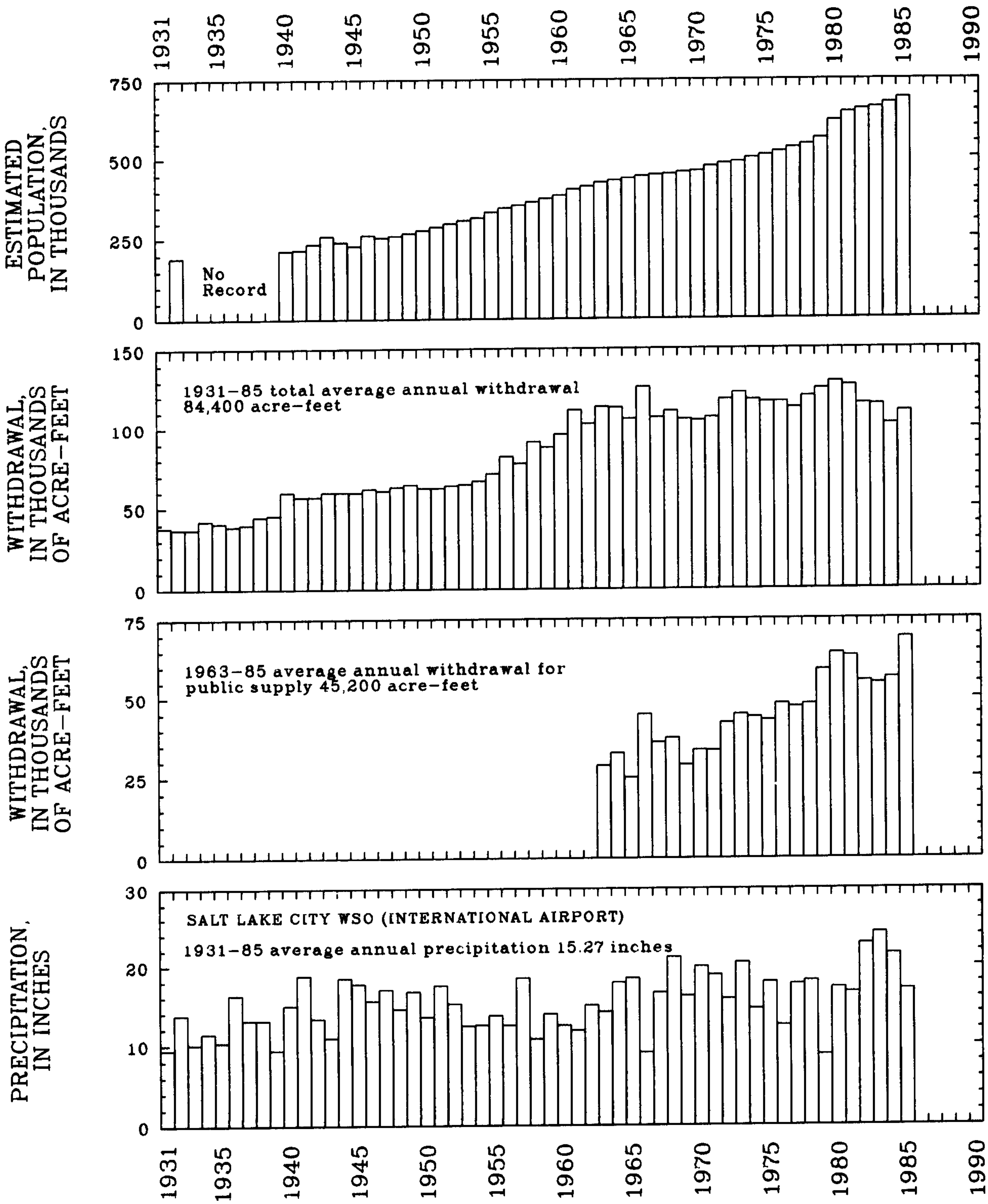


Figure 9.—Estimated population of Salt Lake County, total annual withdrawals from wells, annual withdrawal for public supply, and average annual precipitation at Salt Lake City WSO (International Airport).

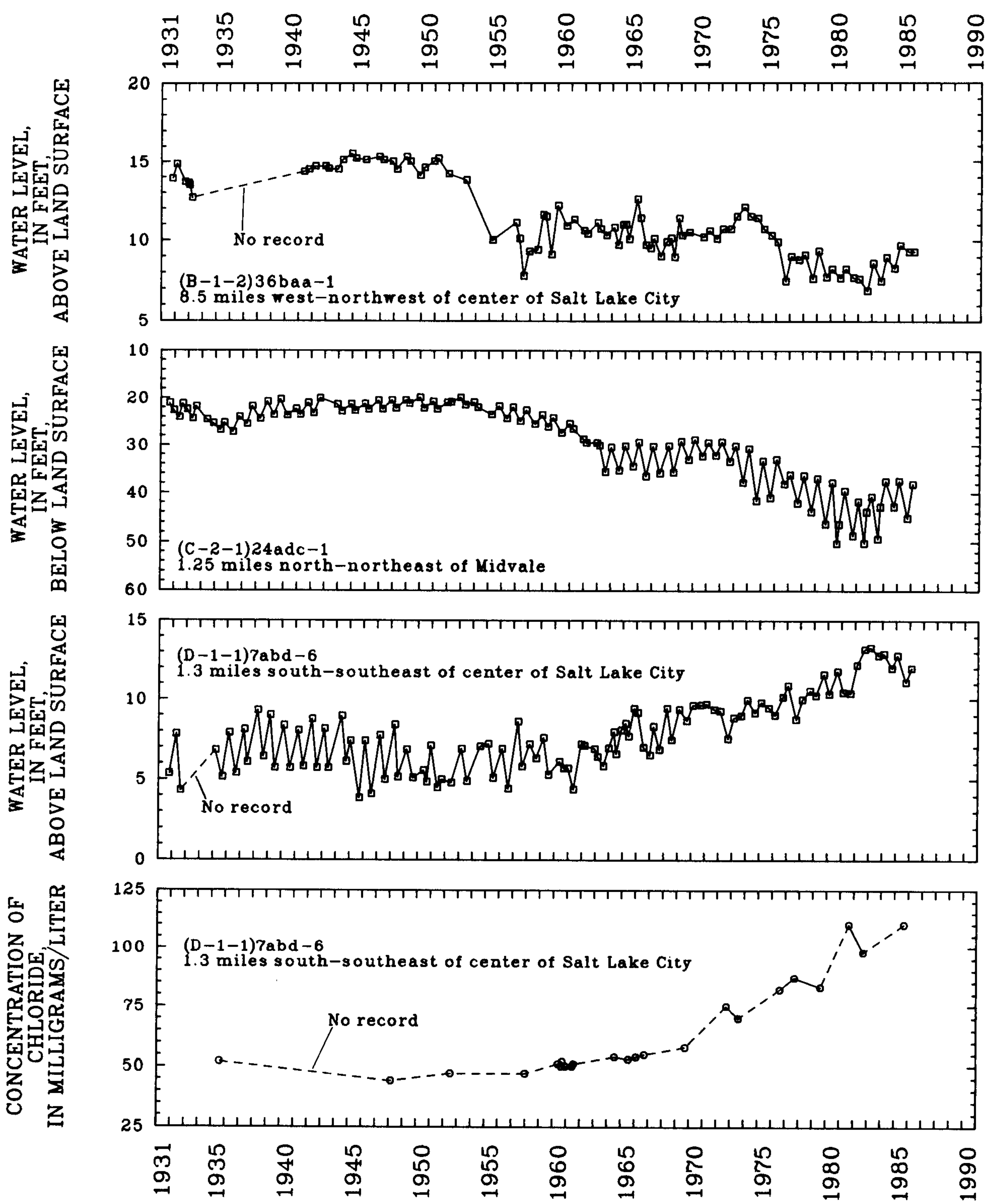


Figure 10.—Relation of water levels and chloride concentration in the principal aquifer in selected wells in Salt Lake Valley to cumulative departure from the average annual precipitation at Silver Lake Brighton.

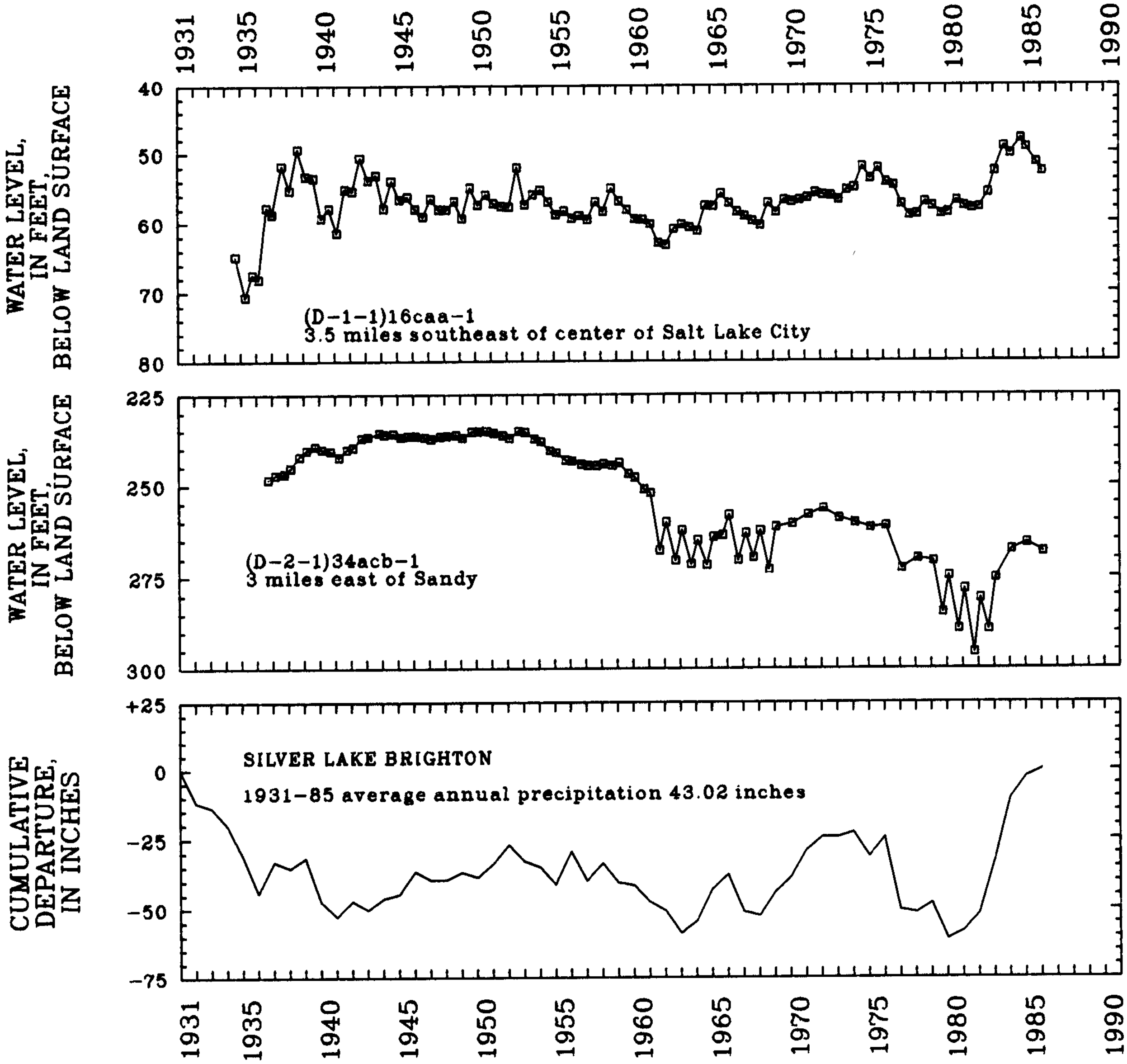


Figure 10.—Continued

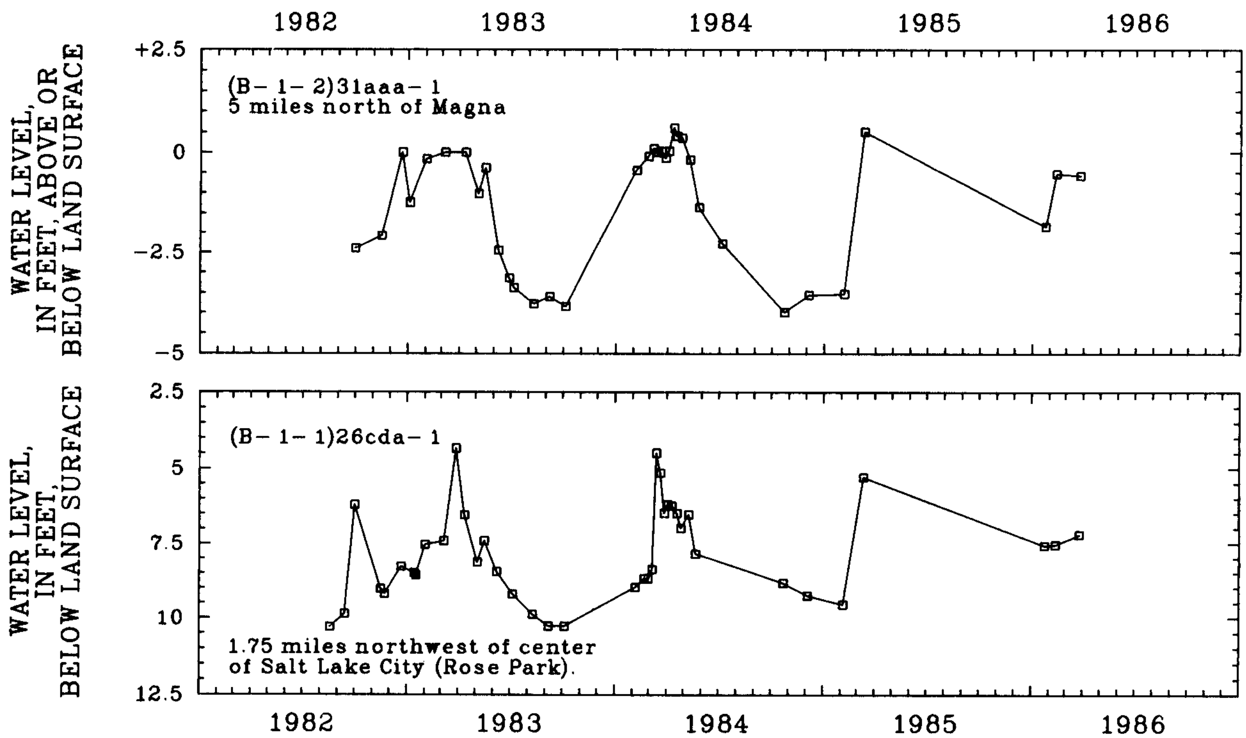


Figure 11.—Water levels in selected wells in the shallow water–table aquifer in Salt Lake Valley.

TOOELE VALLEY

by Dale E. Wilberg

During 1985, withdrawal of water from wells in Tooele Valley was approximately 21,000 acre-feet, which is a decrease of 2,000 acre-feet from that reported for 1984 and 7,000 acre-feet less than the average annual withdrawal for 1975-84 (table 2). Withdrawal from wells for public supply decreased by nearly 70 percent. This large decline reflects greater use of water from springs following the repair and improvement of spring collection facilities by the city of Tooele after the damaging floods of 1984.

Discharge from Fishing Creek, Sixmile Creek, Mill Pond, and Dunne's Pond Springs is unknown because data usually collected and provided by private industry are not available. However, diversion of water from springs to Salt Lake Valley for industrial use was 3,200 acre-feet, which is a decrease of 79 percent from 1984 and reflects a decrease in industrial demands.

Water levels in Tooele Valley declined as much as 7 feet along the alluvial benches adjacent to the Oquirrh Mountains and along the Stansbury Mountains in the southwestern part of the valley, and rose as much as 6 feet in the valley center from March 1985 to March 1986 (fig. 12). The declines along the southwestern margin of the valley may be due partly to increased withdrawals from wells and reduced flow in and reduced recharge from streams.

The relation of water levels in selected observation wells, precipitation at Tooele, and annual withdrawals from wells is shown in figure 13. Precipitation at Tooele in 1985 was 21.77 inches. This is 4.56 inches above the average annual precipitation for 1936-85, and it is the fourth consecutive year that annual precipitation has been greater than 4 inches above the average annual precipitation.

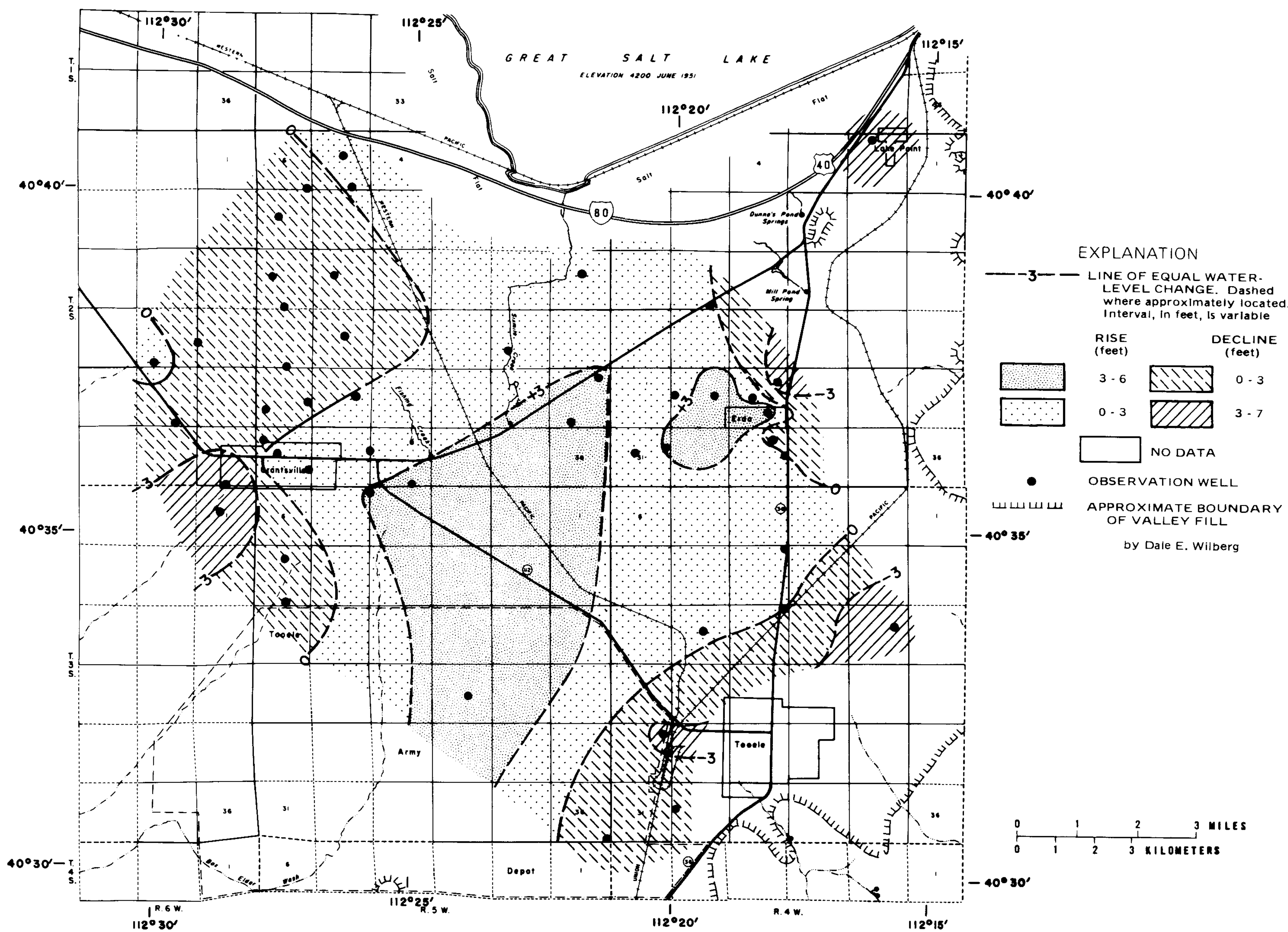


Figure 12.–Map of Tooele Valley showing change of water levels in artesian aquifers from March 1985 to March 1986.

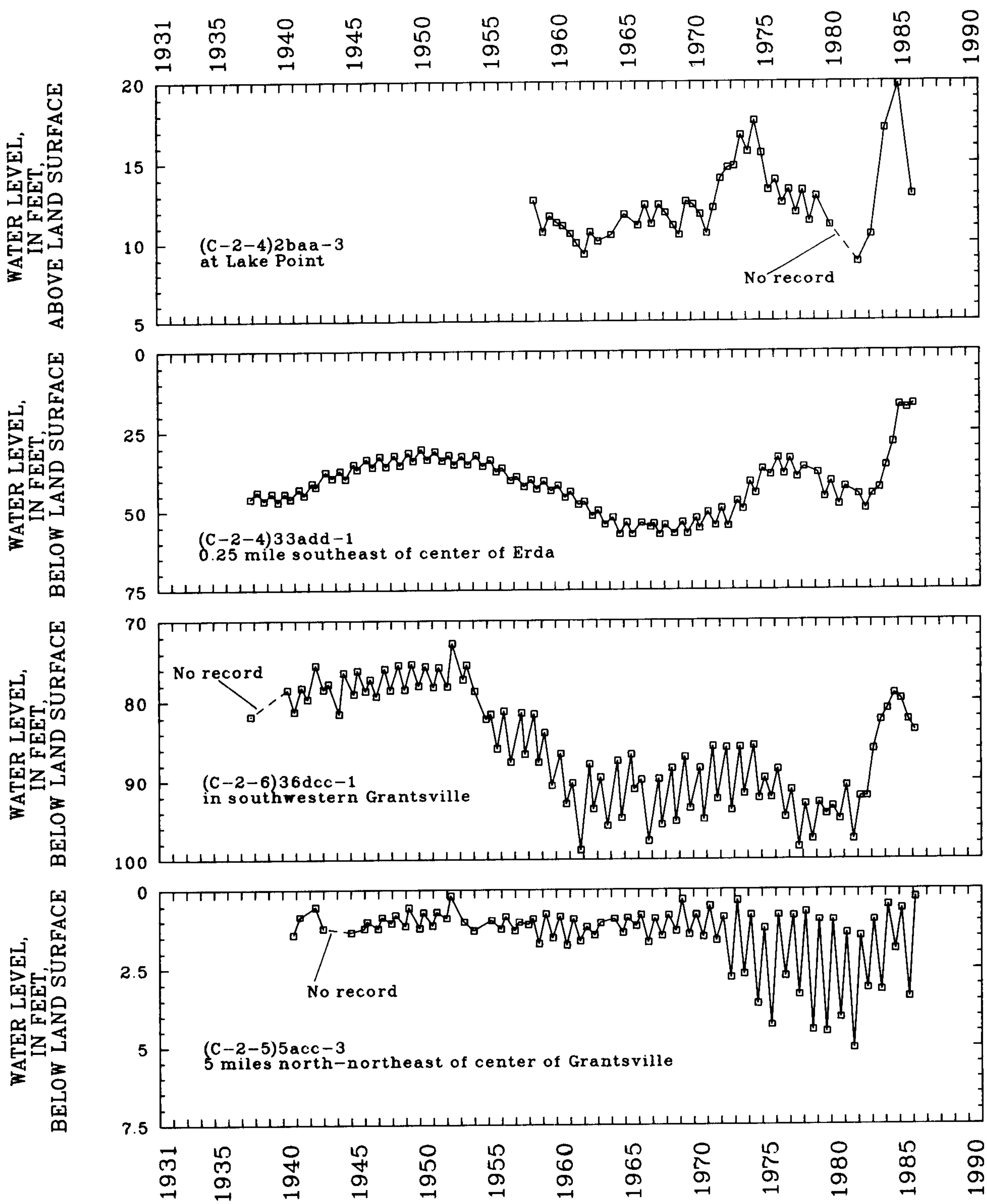


Figure 13.—Relation of water levels in selected wells in Tooele Valley to cumulative departure from the average annual precipitation at Tooele and to annual withdrawals from wells.

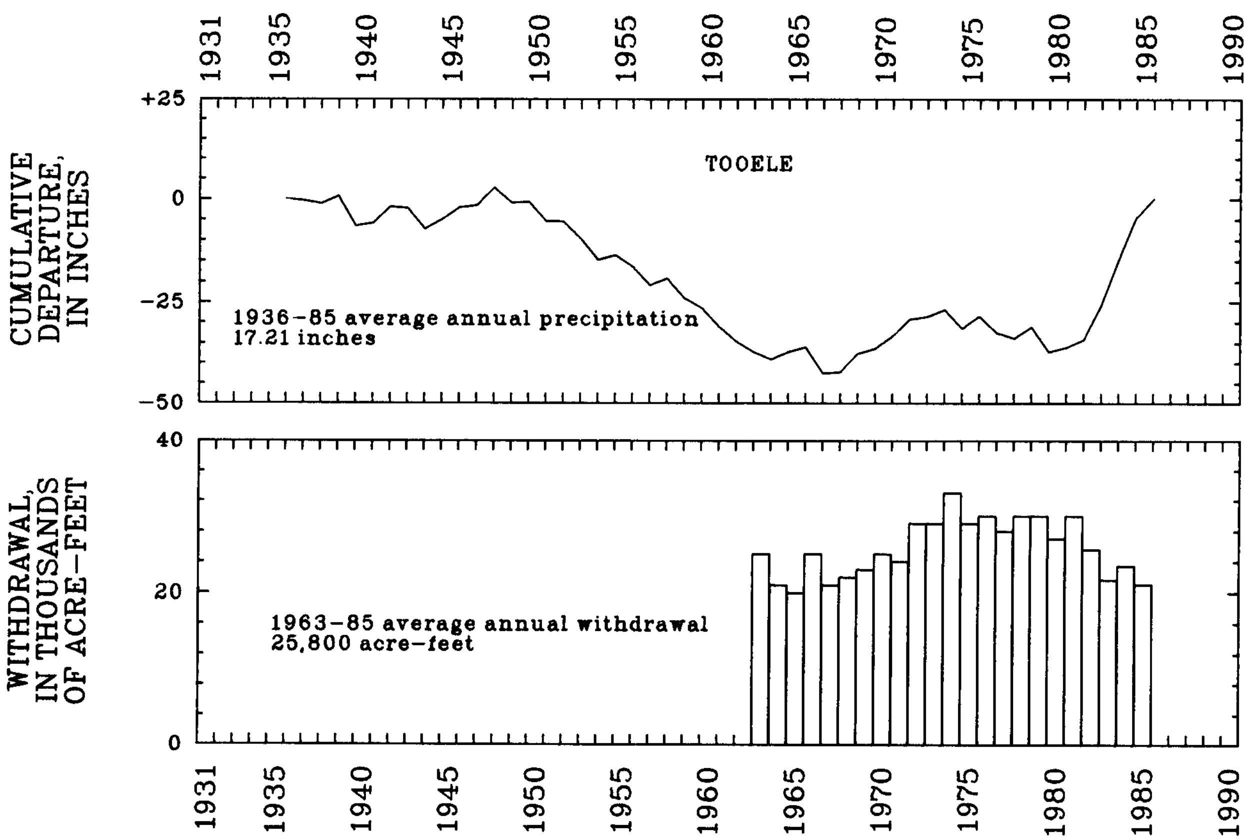


Figure 13.—Continued

UTAH AND GOSHEN VALLEYS

by Carole Burden

Withdrawal of water from wells in Utah and Goshen Valleys in 1985 was about 88,000 acre-feet. This was 10,000 acre-feet more than in 1984 and 9,000 acre-feet less than the average annual withdrawal for 1975-84 (table 2). Withdrawal in Utah Valley was 76,000 acre-feet, or 6,000 acre-feet more than in 1984. Withdrawal in Goshen Valley was 12,000 acre-feet, or 4,000 acre-feet more than in 1984. These increases were mainly due to increased withdrawal for irrigation and municipal use.

Water levels in Goshen Valley generally declined from March 1985 to March 1986, except in the northernmost part of the valley, where water levels rose slightly (fig. 14). The declines were due to continued large withdrawals for irrigation. Water levels in Utah Valley generally declined from March 1985 to March 1986, except in the water-table and deep artesian aquifers beneath the Lehi-American Fork area, Provo Bay area, and the east bench area near Pleasant Grove (figs. 14-17). The declines were due to continued large withdrawals for municipal use and the rises were due to above average precipitation. The relation of water levels in selected observation wells to precipitation, total annual withdrawal from wells, annual withdrawals for public supply, and estimated population of Utah County is shown in figure 18.

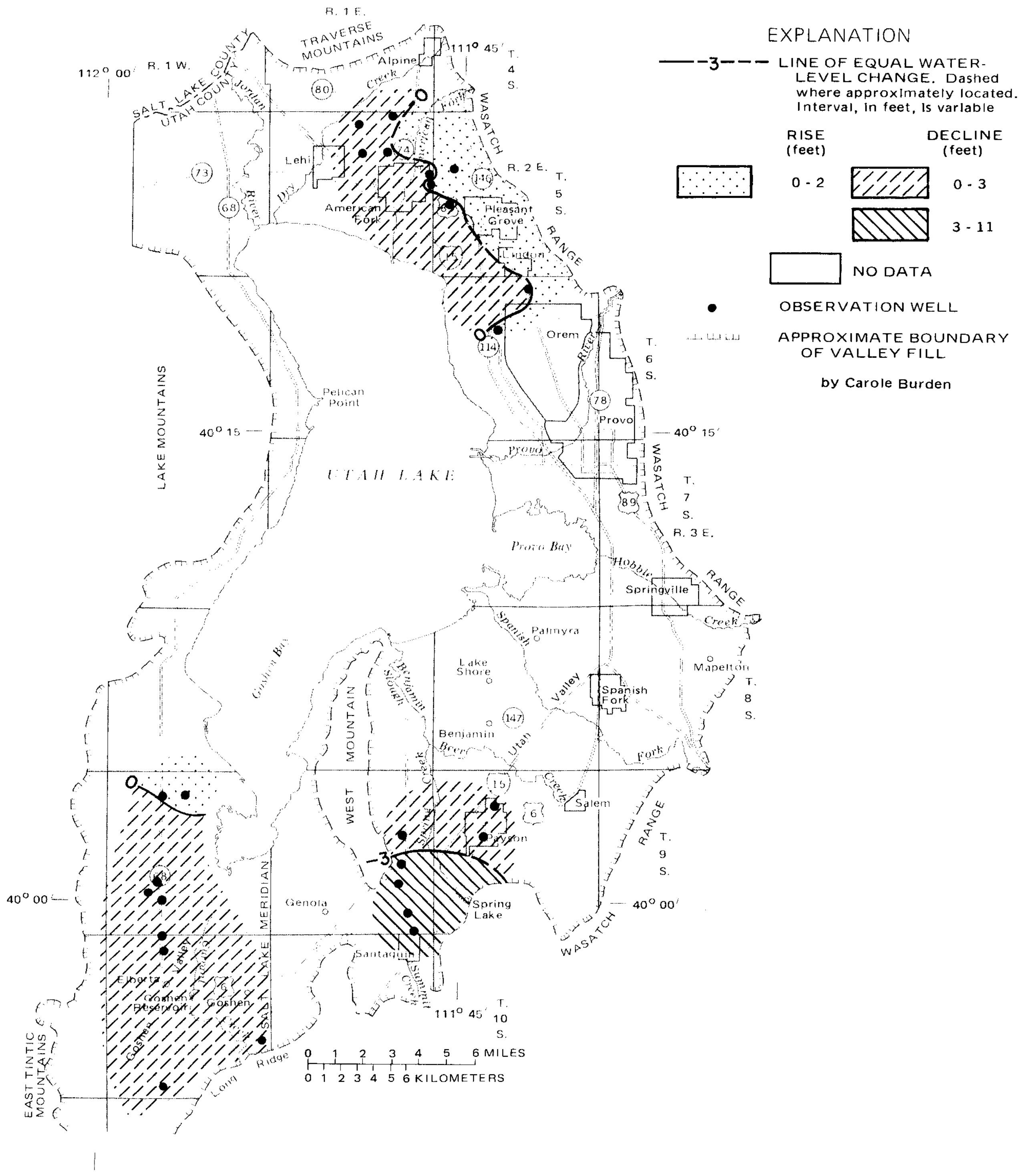


Figure 14.—Map of Utah and Goshen Valleys showing change of water levels in the water-table aquifers from March 1985 to March 1986.

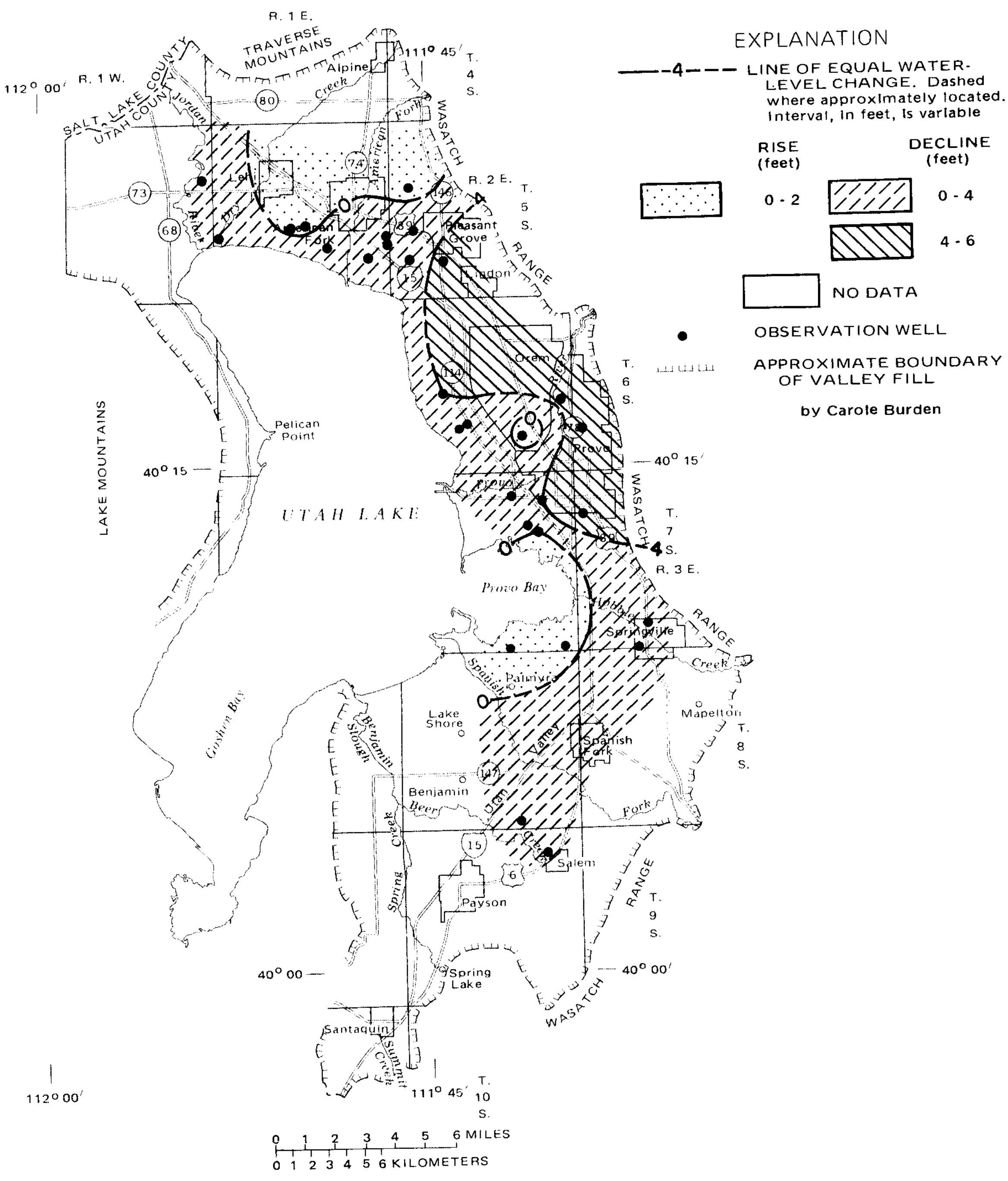


Figure 15.—Map of Utah Valley showing change of water levels in the shallow artesian aquifer in deposits of Pleistocene age from March 1985 to March 1986.

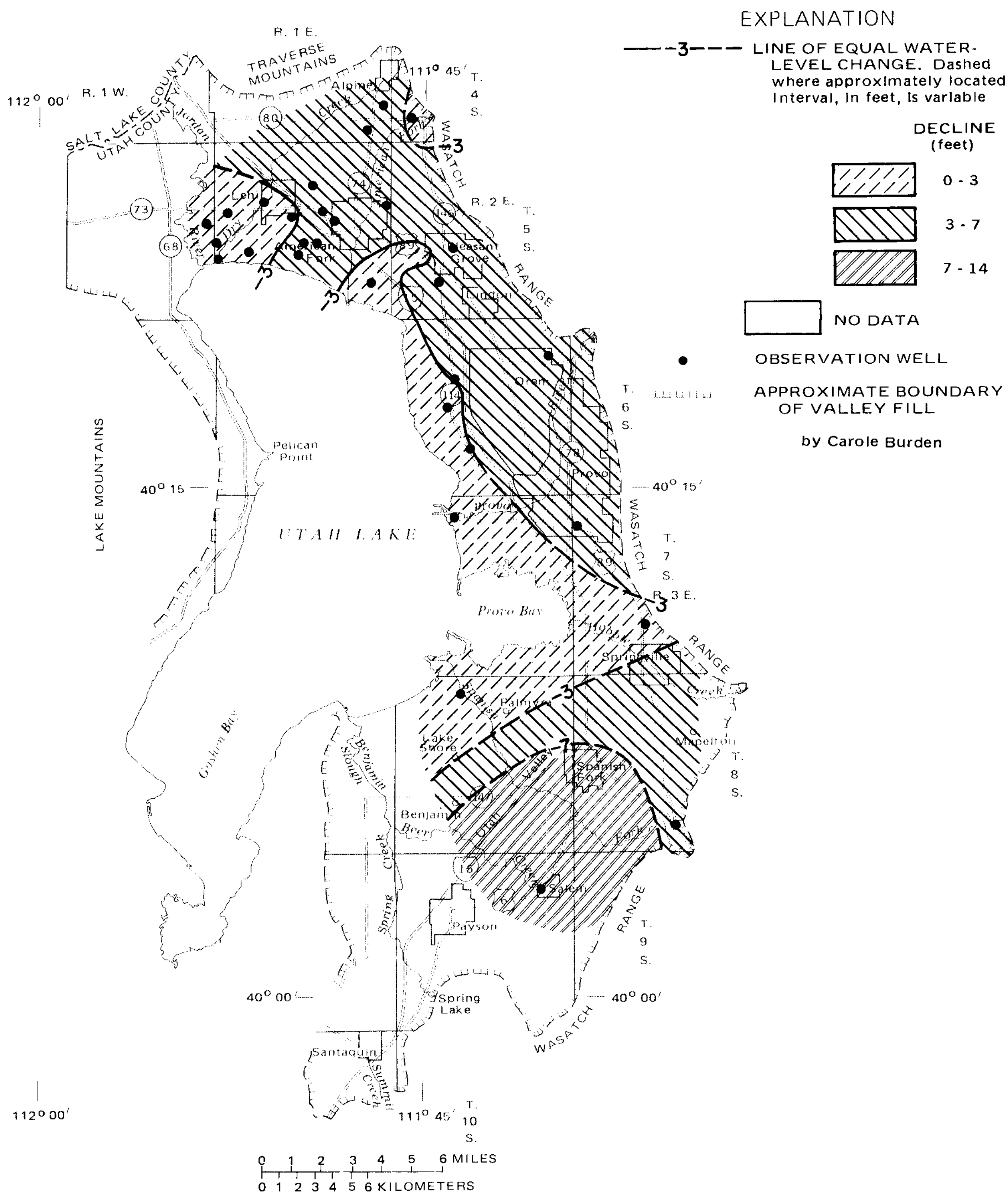


Figure 16.—Map of Utah Valley showing change of water levels in the deep artesian aquifer in deposits of Pleistocene age from March 1985 to March 1986.

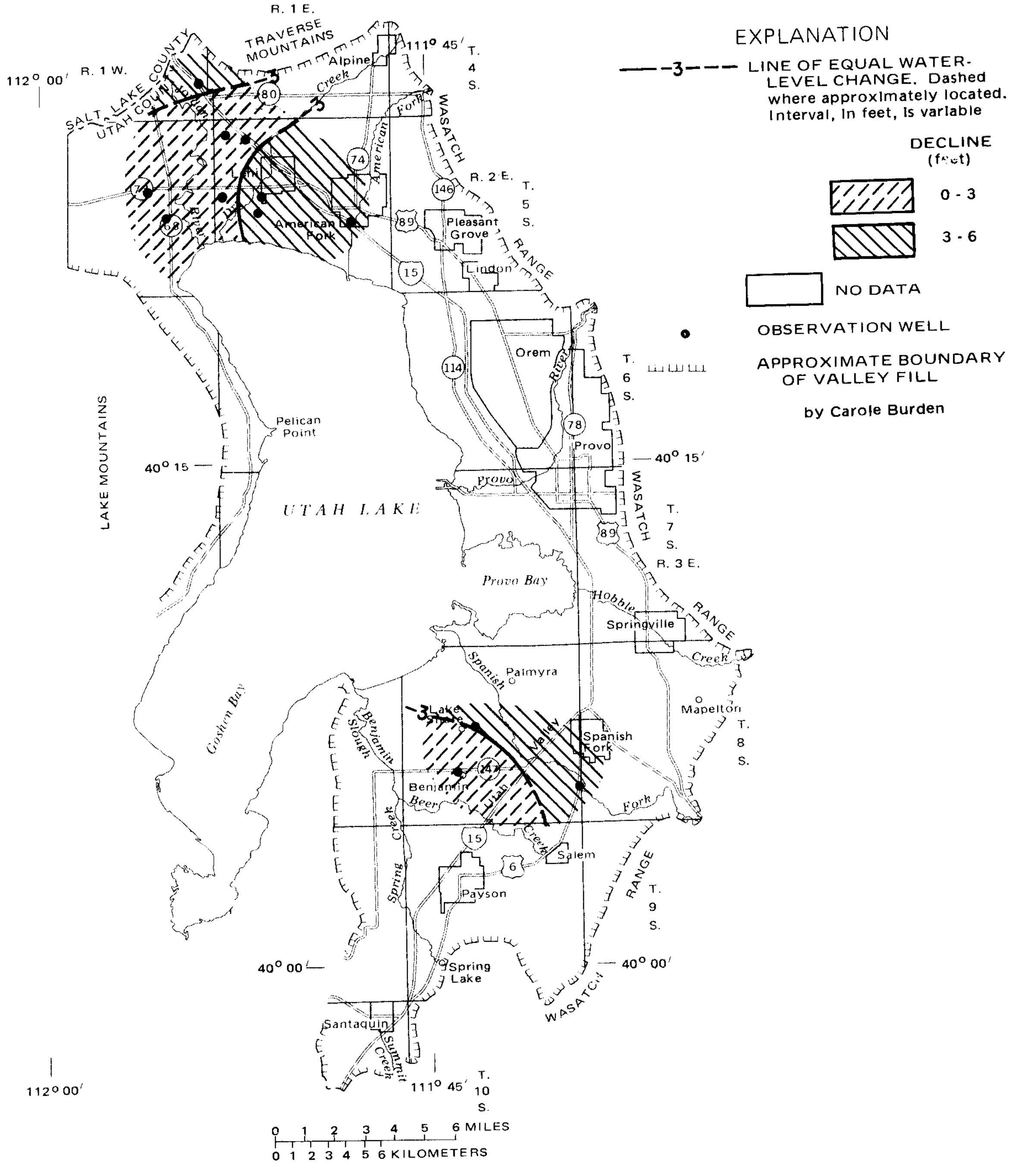


Figure 17.—Map of Utah Valley showing change of water levels in the artesian aquifer in deposits of Quaternary or Tertiary age from March 1985 to March 1986.

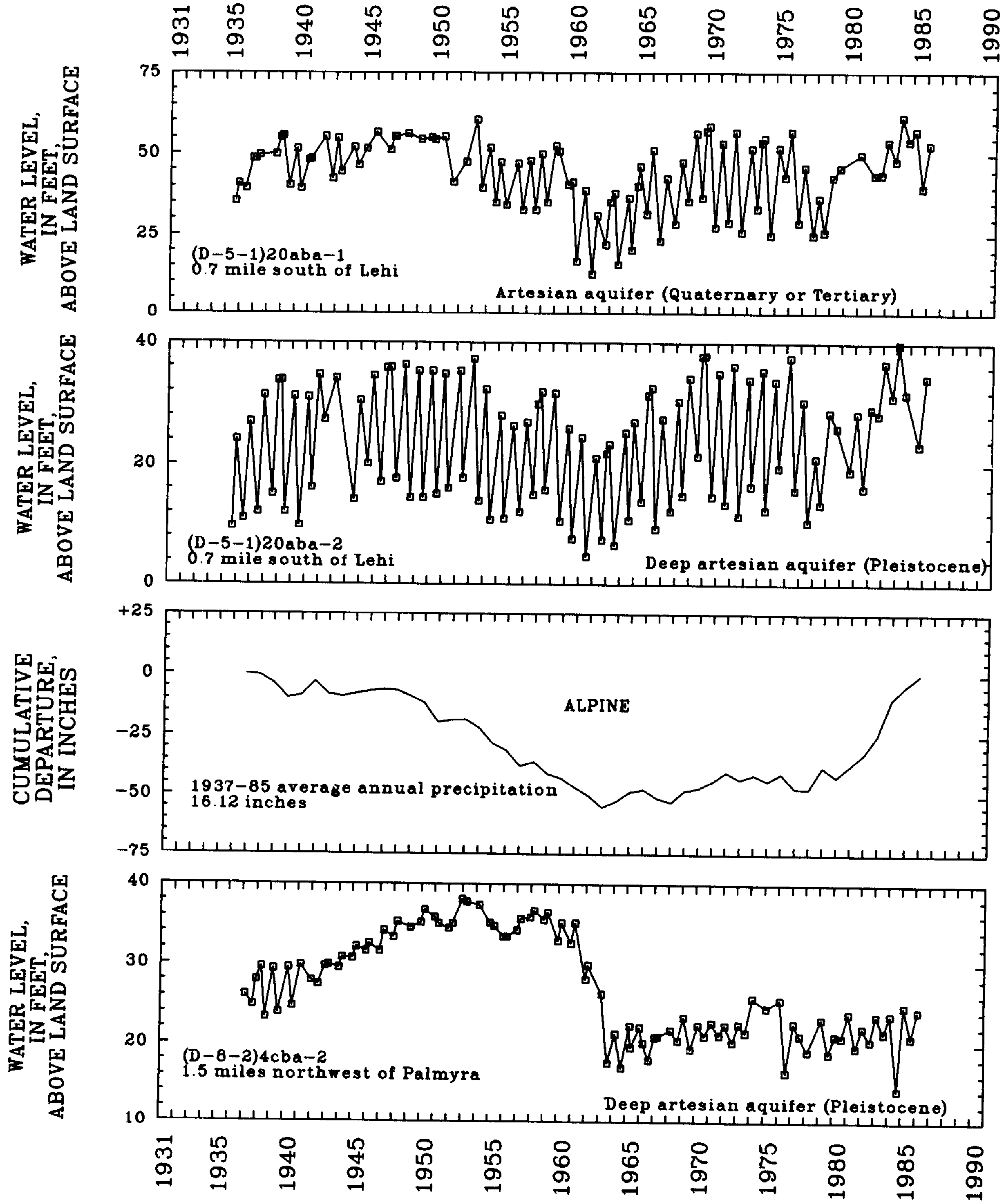


Figure 18.—Relation of water levels in selected wells to cumulative departure from the average annual precipitation at Alpine and Spanish Fork Powerhouse, and total annual withdrawals from wells, and annual withdrawals for public supply in Utah and Goshen Valleys, and estimated population of Utah County.

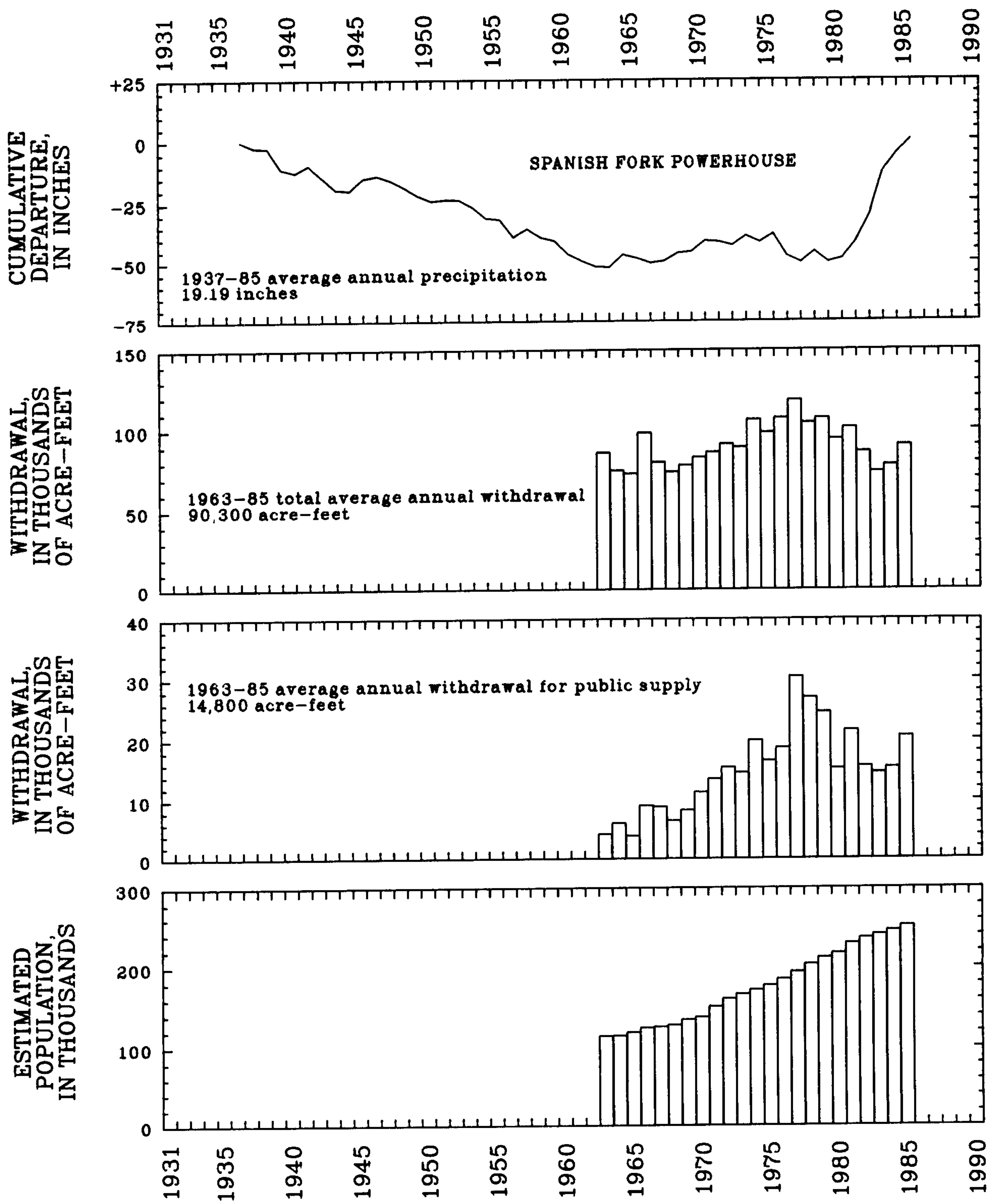


Figure 18.—Continued

JUAB VALLEY

by R. B. Garrett

Withdrawal of water from wells in Juab Valley during 1985 was about 11,000 acre-feet. This is 5,000 acre-feet more than reported for 1984 and 8,000 acre-feet less than the average annual withdrawal for 1975-84 (table 2). The increase in total withdrawal was due mostly to increased withdrawals for irrigation.

Water levels generally declined from March 1985 to March 1986 in the north and the south ends of the valley where most of the withdrawals occurred. The largest decline of about 9 feet occurred in a well near Levan. Water levels rose in the Levan Ridge area, with maximum measured rises of about 10 feet (fig. 19).

The relation of water levels in two observation wells, annual withdrawals from wells, and cumulative departure from the average annual precipitation for 1935-85 at Nephi is shown in figure 20. Precipitation at Nephi during 1985 Figures 19 and 20 near here was 17.73 inches, which is 3.43 inches above the average annual precipitation for 1935-85.

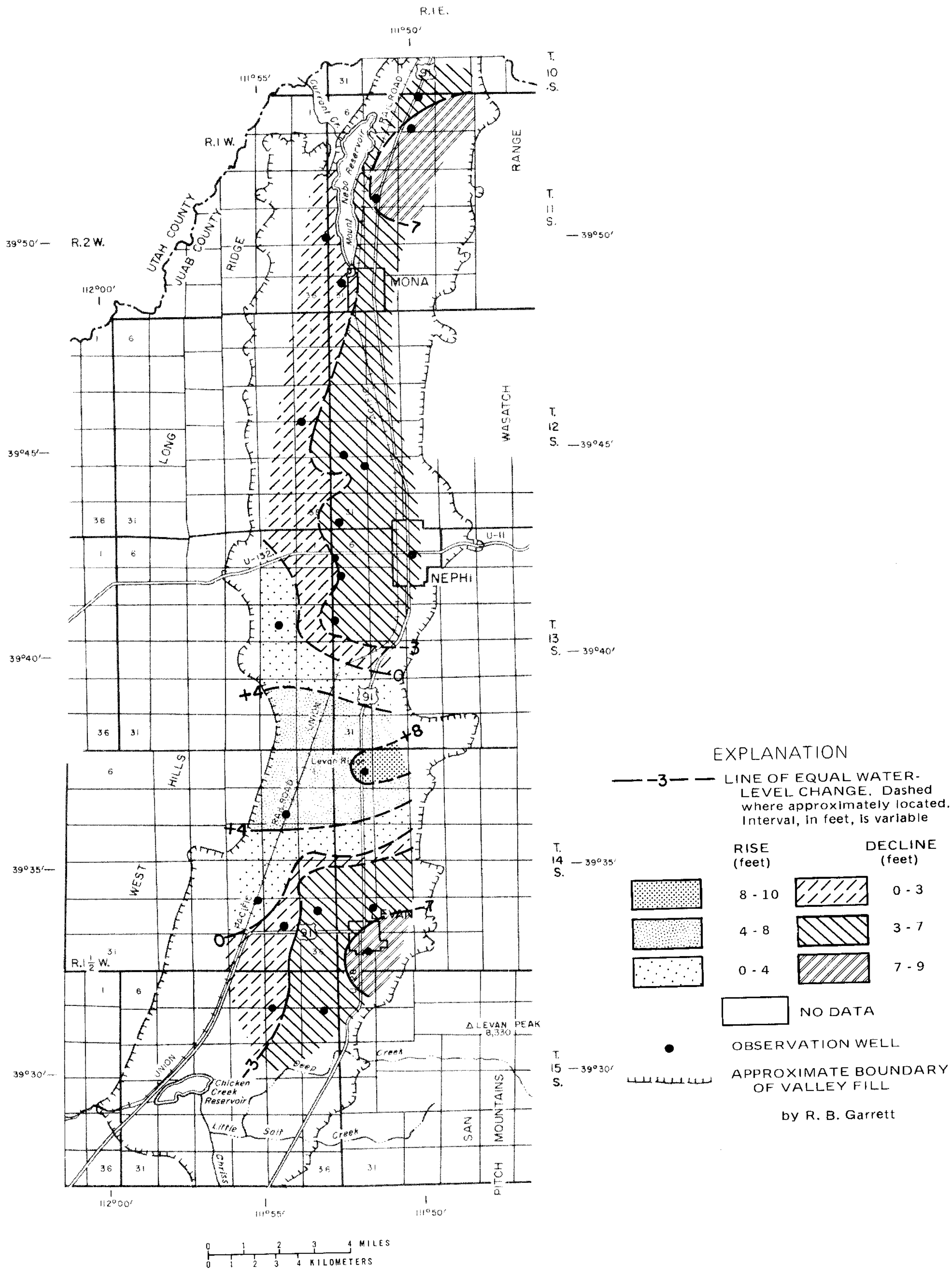


Figure 19.—Map of Juab Valley showing change of water levels from March 1985 to March 1986.

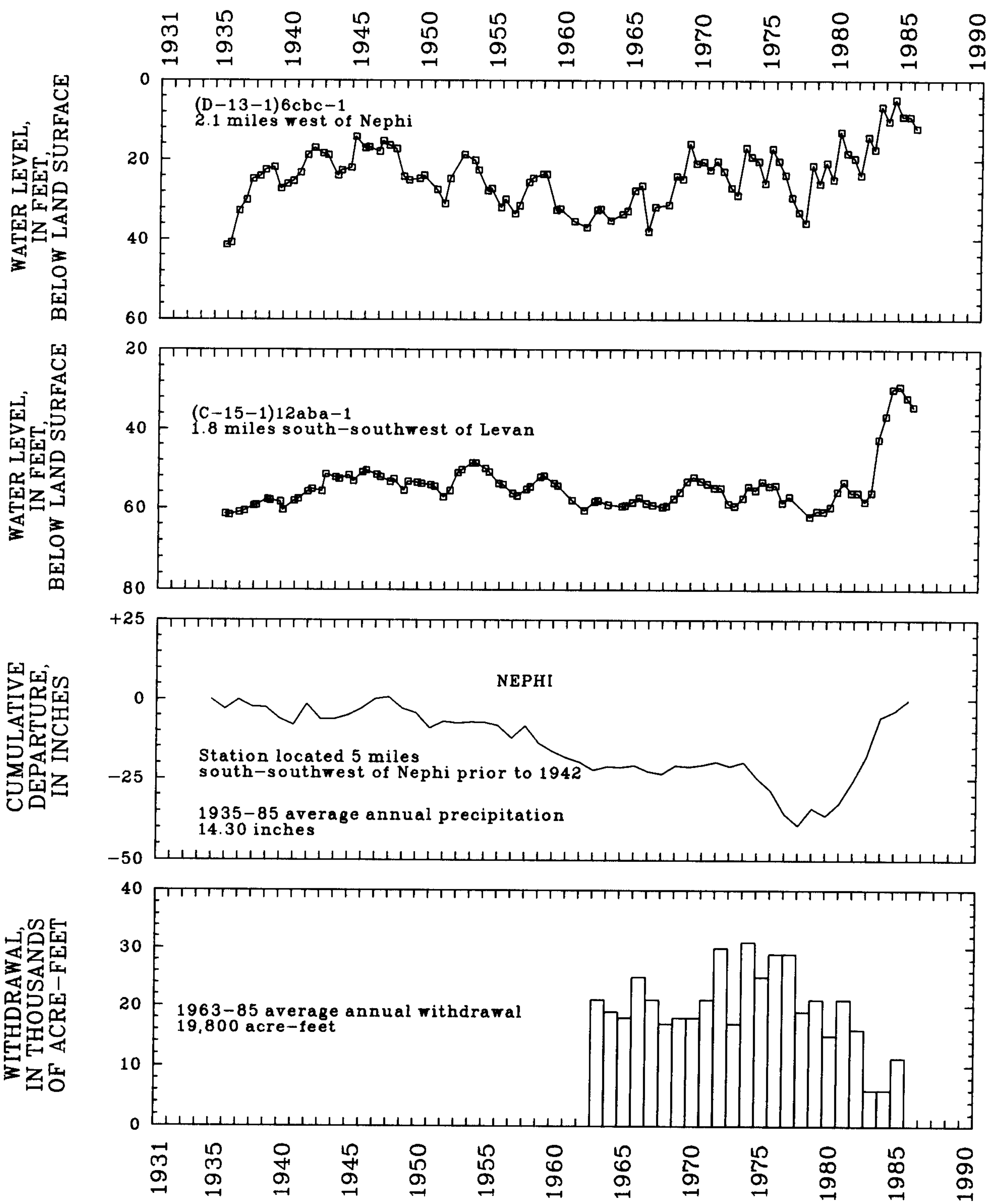


Figure 20.—Relation of water levels in selected wells in Juab Valley to cumulative departure from the average annual precipitation at Nephi and to annual withdrawals from wells.

SEVIER DESERT

by Michael Enright

Withdrawal of water from wells in the Sevier Desert in 1985 was about 13,000 acre-feet. This was 3,000 acre-feet more than was reported for 1984 and about 13,000 acre-feet less than the 1975-84 average annual withdrawal (table 2). The relatively small withdrawal during 1985 was due to the availability of above normal supplies of surface water for irrigation. During 1985, the Sevier River near Juab discharged 504,400 acre-feet (fig. 21). This was 487,200 acre-feet less than the 1984 discharge, but about 322,100 acre-feet more than the 1935-85 average annual discharge.

Water-levels in the shallow artesian aquifer generally rose from March 1985 to March 1986 (fig. 22). The largest observed rise was more than 6 feet in a well 4 miles north of Oak City. The largest decline was about 2 feet in a well 1.5 miles north of Oak City. Water levels in the deep artesian aquifer also generally rose from March 1985 to March 1986 (fig. 23). Rises in both aquifers can be attributed to continued below average ground-water withdrawals, and above average precipitation. More than 80 percent of the water-level changes from March 1985 to March 1986 were less than 1 foot.

The long-term relation of water levels in selected wells, discharge of the Sevier River near Juab, precipitation at Oak City, and annual withdrawals from wells are shown in figure 21. Precipitation at Oak City in 1985 was 14.38 inches, 1.52 inches above the 1935-85 average annual precipitation.

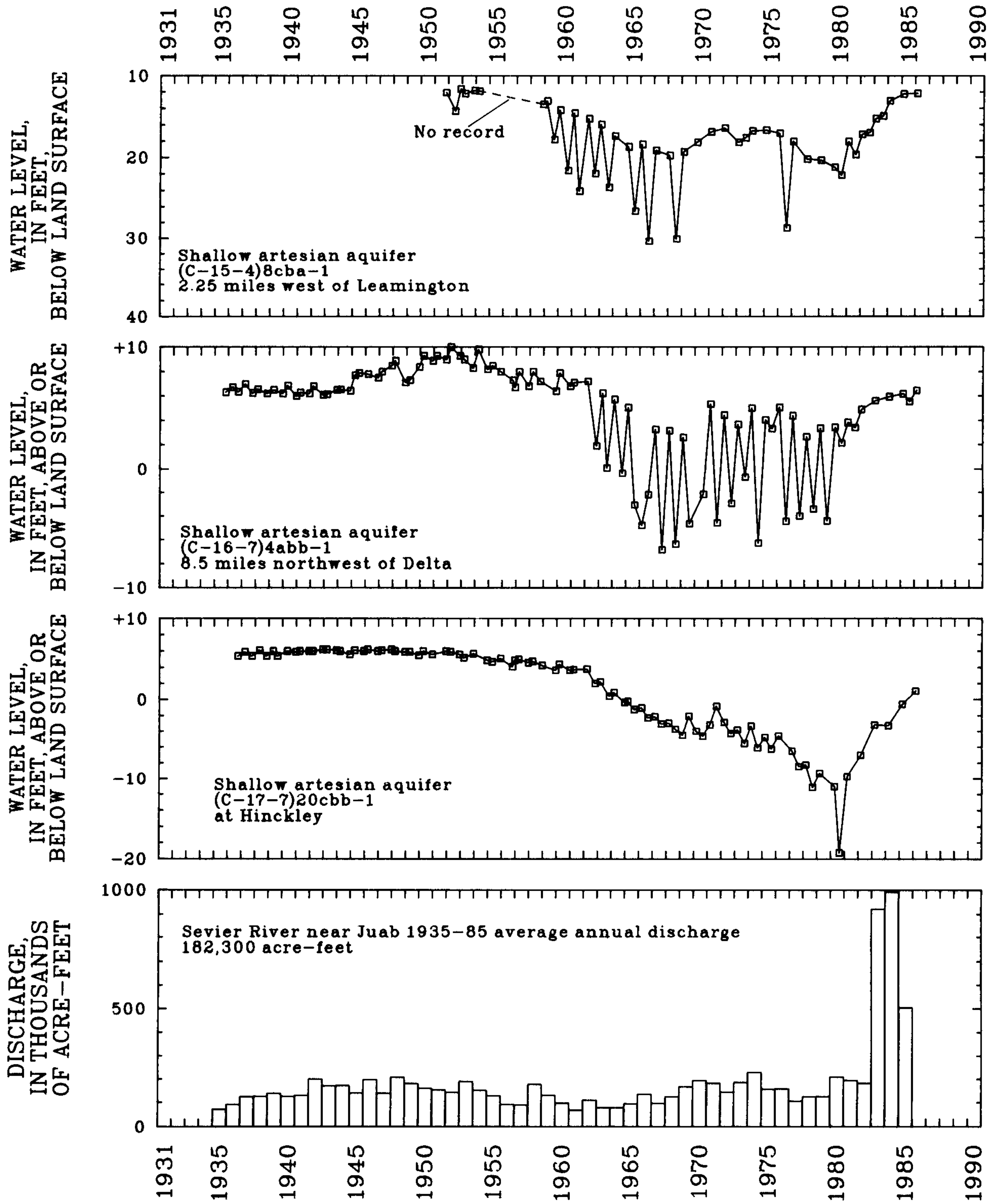


Figure 21.—Relation of water levels in selected wells in the Sevier Desert to discharge of the Sevier River near Juab, to cumulative departure from the average annual precipitation at Oak City, and to annual withdrawals from wells.

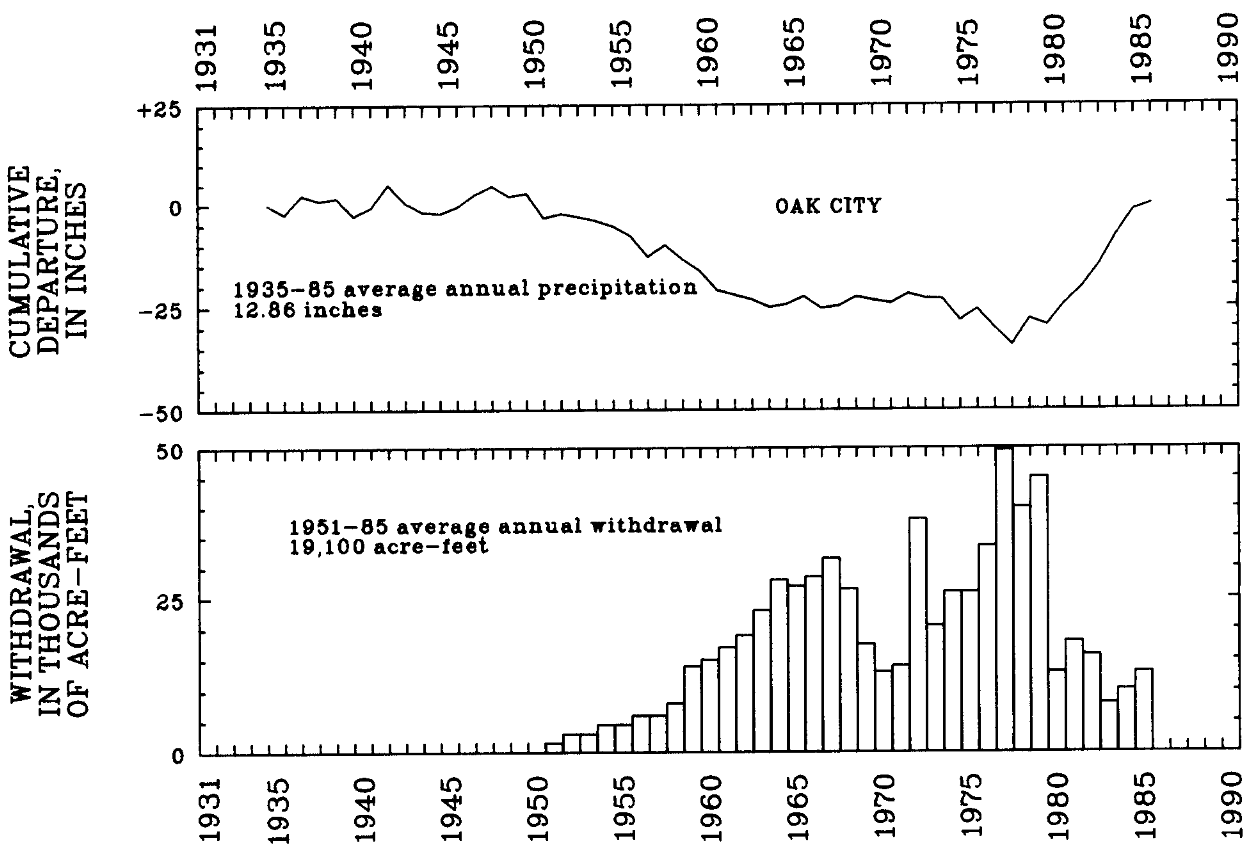


Figure 21.—Continued

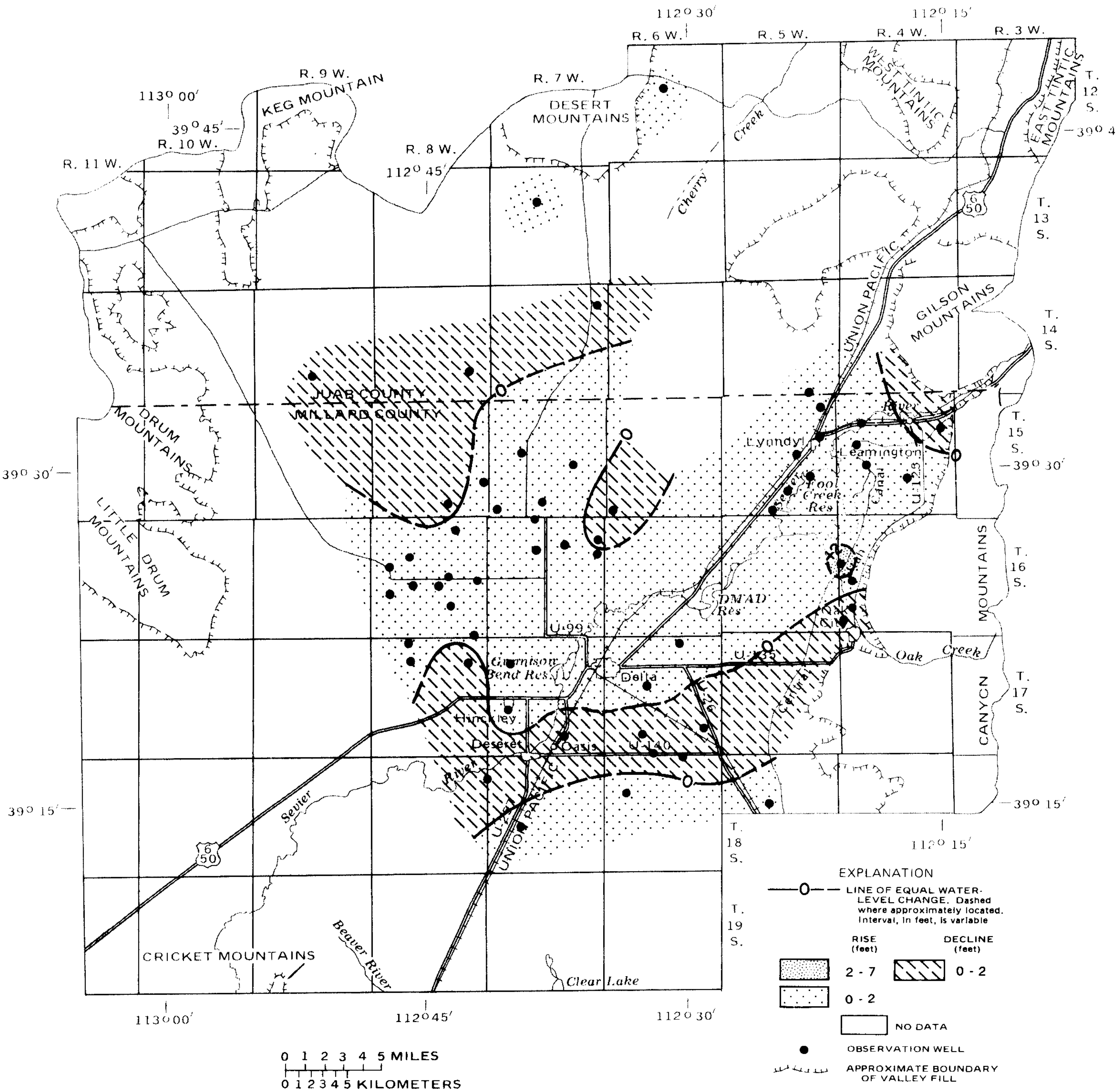


Figure 22.—Map of part of the Sevier Desert showing change of water levels in the shallow artesian aquifer, March 1985 to March 1986.

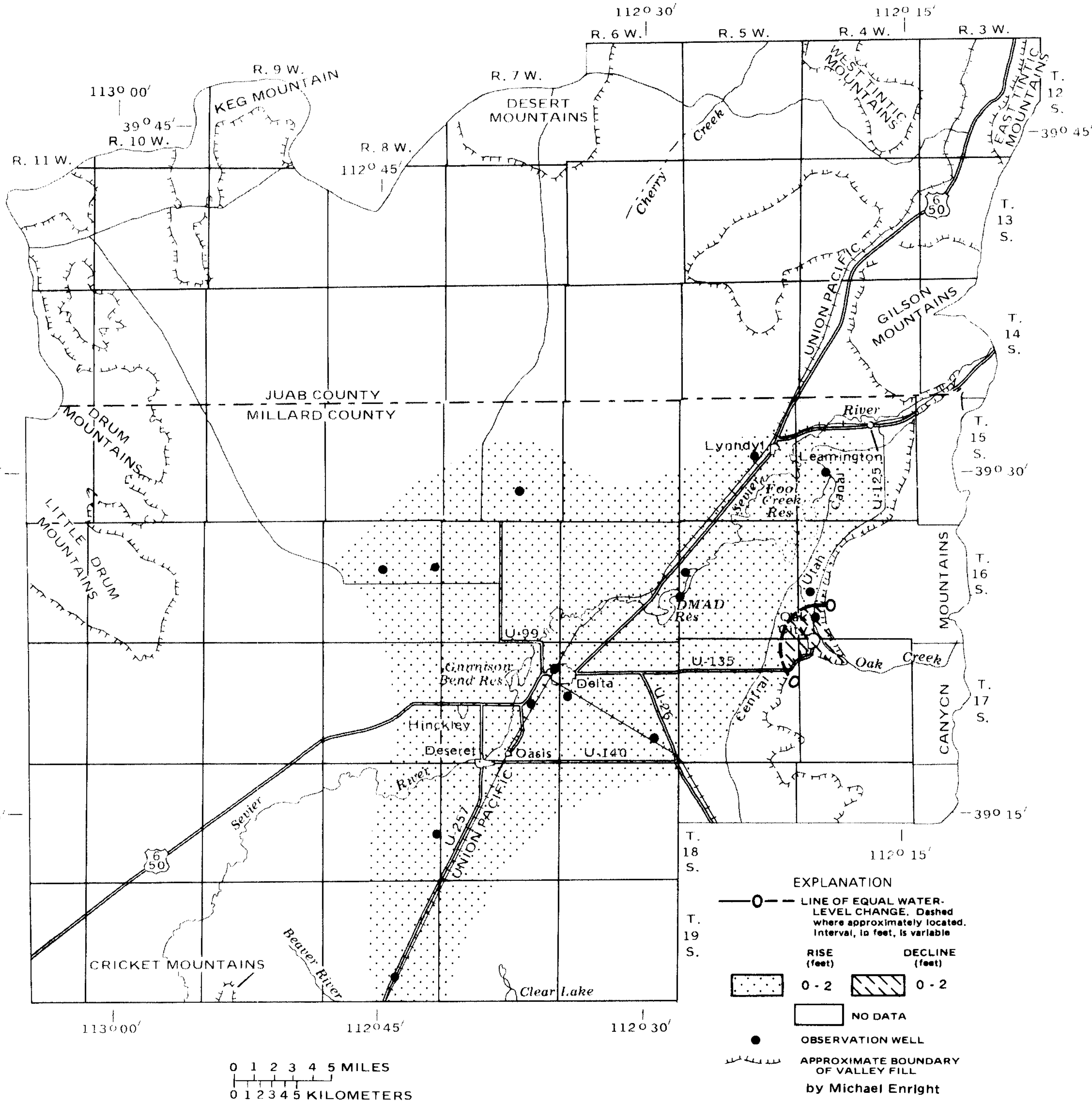


Figure 23.—Map of part of the Sevier Desert showing change of water levels in the deep artesian aquifer, March 1985 to March 1986.

UPPER AND CENTRAL SEVIER VALLEYS AND UPPER FREMONT RIVER VALLEY

By D. C. Emett

Withdrawal of water from wells in the upper and central Sevier Valleys and upper Fremont River valley in 1985 was approximately 21,000 acre-feet, 1,000 acre-feet more than in 1984 and about 3,000 acre-feet less than the average annual withdrawal for 1975-84 (table 2). The decrease was caused mostly by smaller withdrawals for irrigation and public supply. Withdrawals decreased because precipitation and streamflow were above normal.

Water levels rose in 12 wells, declined in 15 wells, and remained unchanged in 1 well from March 1985 to March 1986 (fig. 24). The largest water-level rise of 5.1 feet was measured in a well northeast of Richfield. The largest water-level decline of 5.0 feet was measured in a well at the Bryce Canyon Airport.

The relation of water levels in selected wells to discharge of the Sevier River at Hatch, and precipitation at Panguitch, Salina, and Loa is shown in figure 25. Precipitation was above normal at all three stations and the discharge of the Sevier River at Hatch was 98,100 acre-feet, about 17,000 acre-feet more than the average for 1940-85.

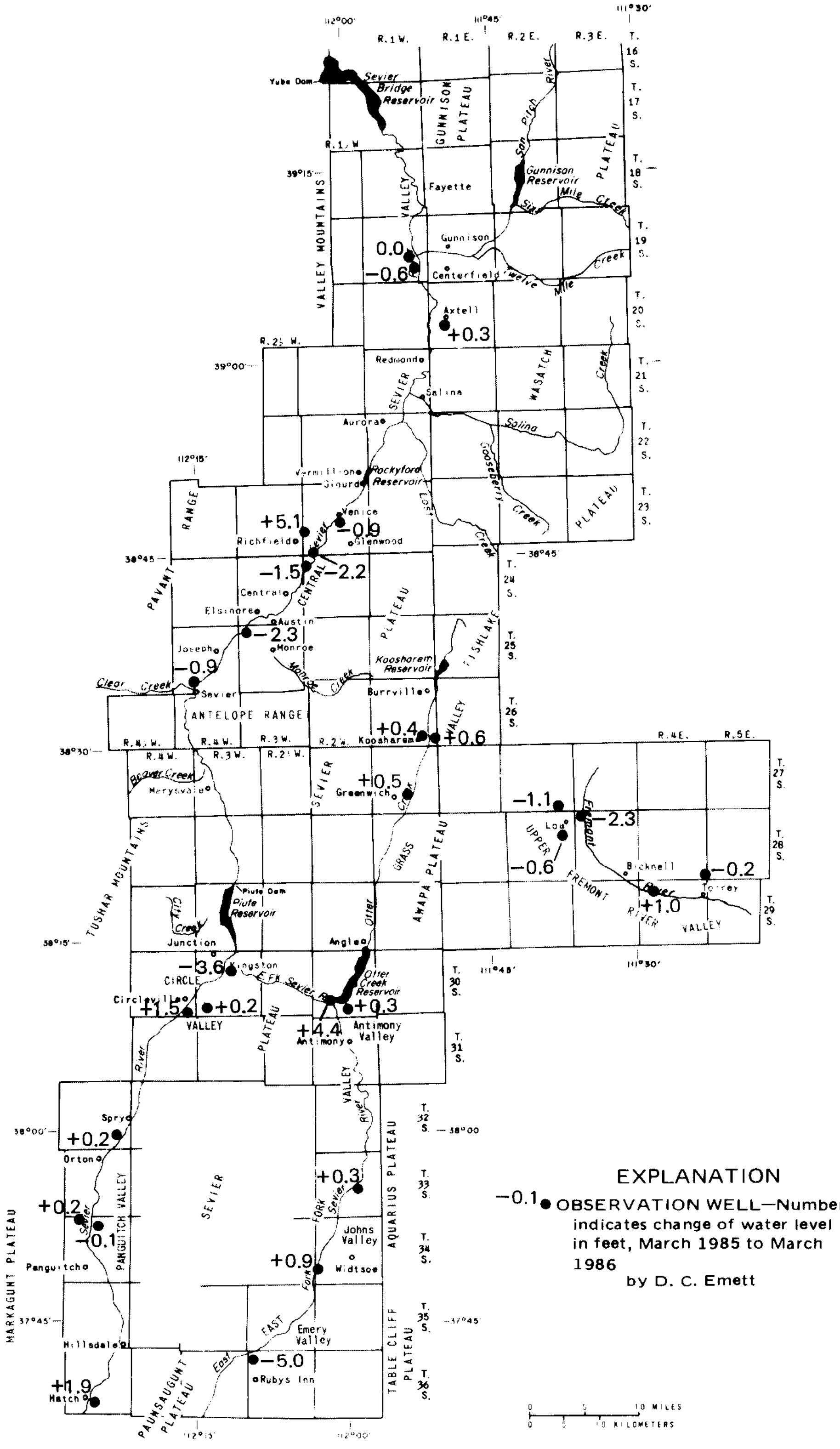


Figure 24.—Map of the upper and central Sevier Valleys and upper Fremont River valley showing change of water levels from March 1985 to March 1986.

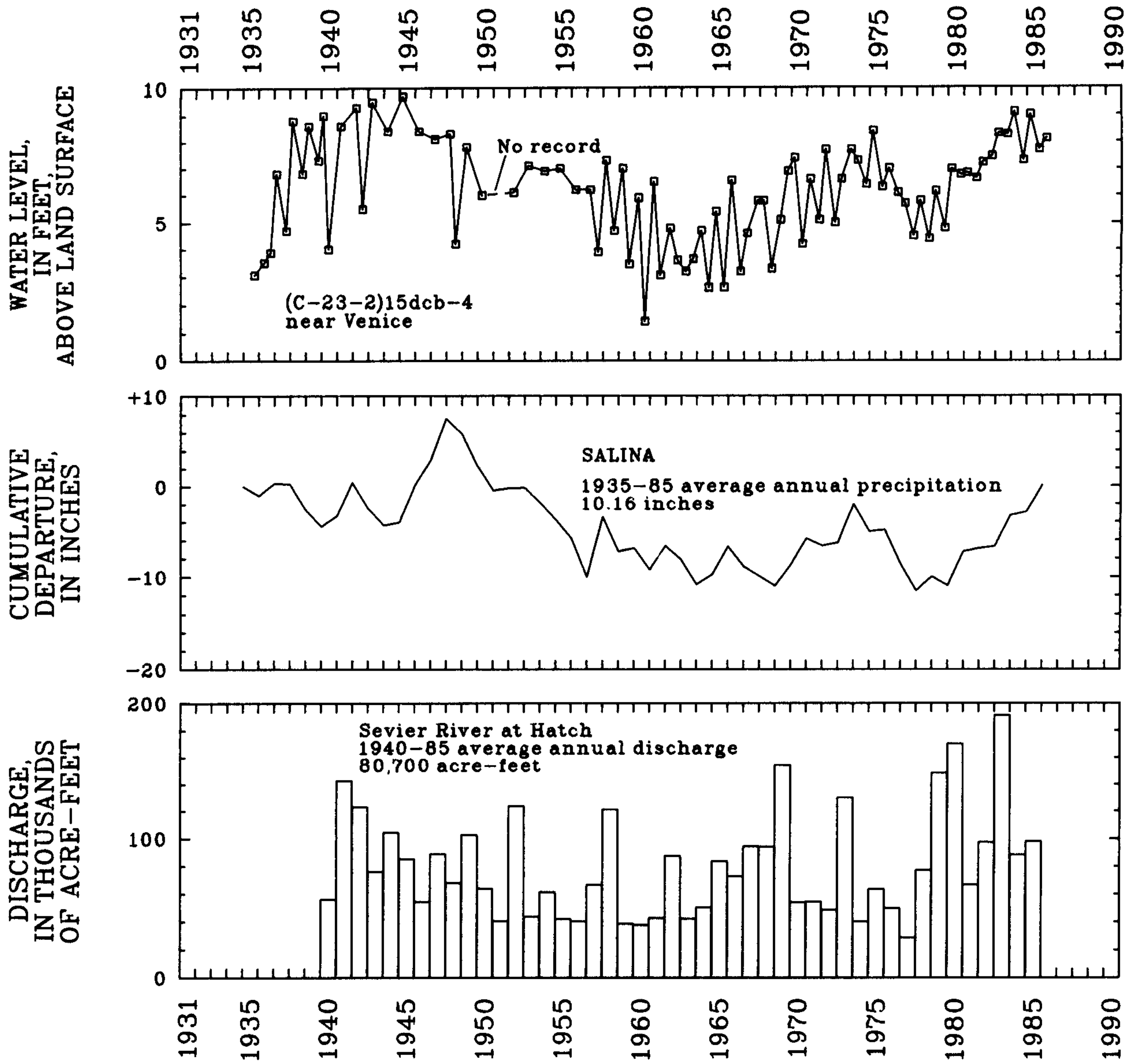


Figure 25.—Relation of water levels in selected wells to discharge of the Sevier River at Hatch, to cumulative departure from average annual precipitation at selected climate stations, and to annual withdrawal from wells—upper and central Sevier Valleys and upper Fremont River valley.

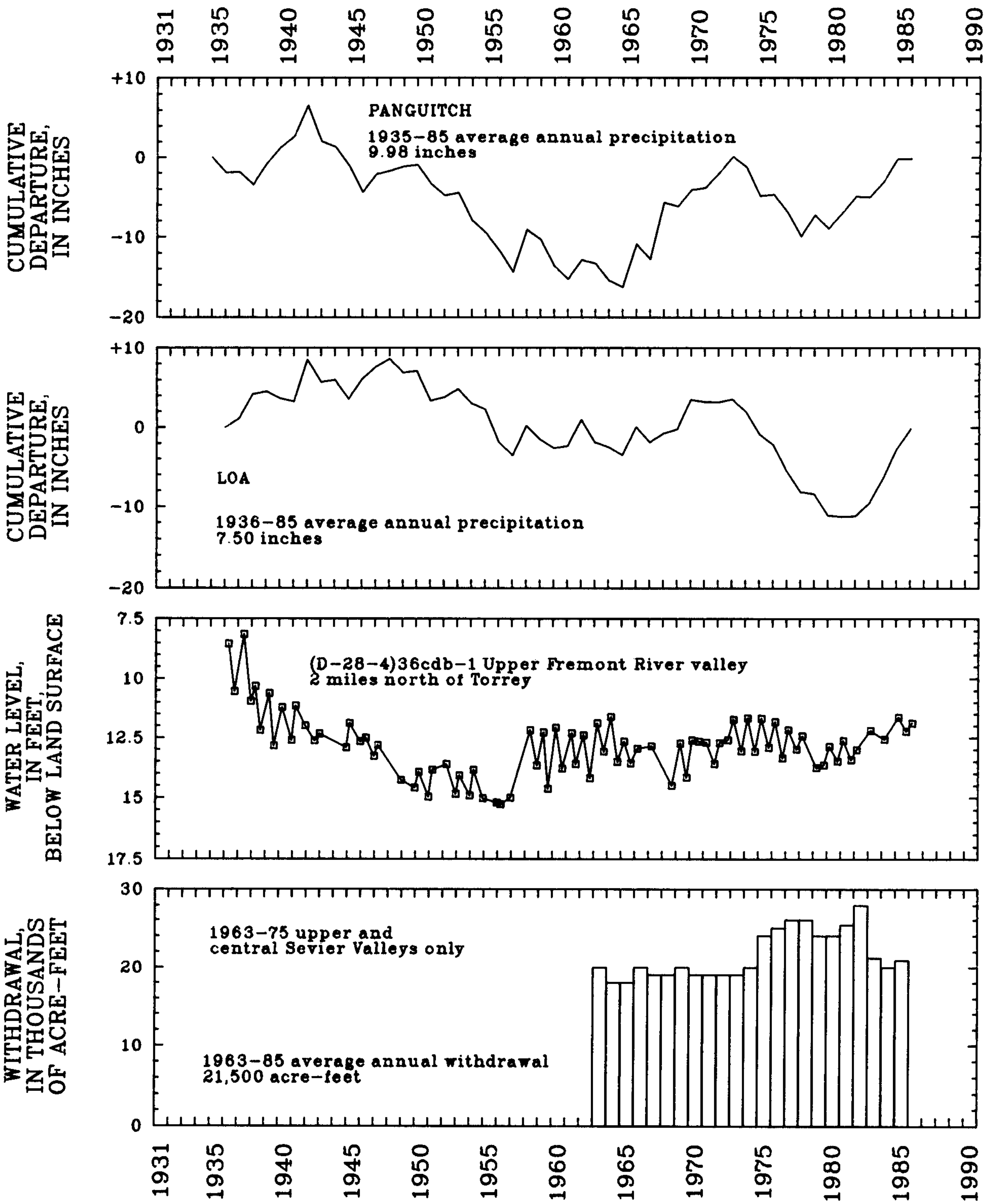


Figure 25.—Continued

PAHVANT VALLEY

by Susan Duncanson

Withdrawal of water from wells in Pahvant Valley in 1985 was about 63,000 acre-feet, which was 21,000 acre-feet more than reported for 1984, and 16,000 acre-feet less than the average annual withdrawal for 1975-84 (table 2). The increase in withdrawal from 1984 to 1985 was mainly due to increased discharge from flowing wells and increased pumpage for irrigation. The flowing-well discharge has increased from less than 300 acre-feet in 1983 to about 9,500 acre-feet in 1984 and about 23,000 acre-feet in 1985.

Water levels rose in the northern and southwestern parts of Pahvant Valley (fig. 26) due to continued above average precipitation combined with below average withdrawals of ground water. The maximum observed rise, about 14 feet, occurred west of Kanosh. The declines in water levels in the central part of the valley are attributed to reduced recharge from three major streams as compared to 1984. Most of the declines were less than 1 foot, with a maximum decline of almost 6 feet recorded in a well northeast of Flowell. Water-level contours depicting the altitude and configuration of the potentiometric surface in Pahvant Valley are shown in figure 27. Water generally moves west from recharge areas bordering the Pahvant Range and Canyon Mountains on the east. Irregularities in the water-level contours near Flowell are probably the result of local ground-water withdrawals.

The long-term relation of precipitation at Fillmore, water-levels in selected observation wells, and annual withdrawals from wells is shown in figure 28. Precipitation in Fillmore in 1985 was 20.06 inches, which is 5.04 inches above the average annual precipitation for 1931-85.

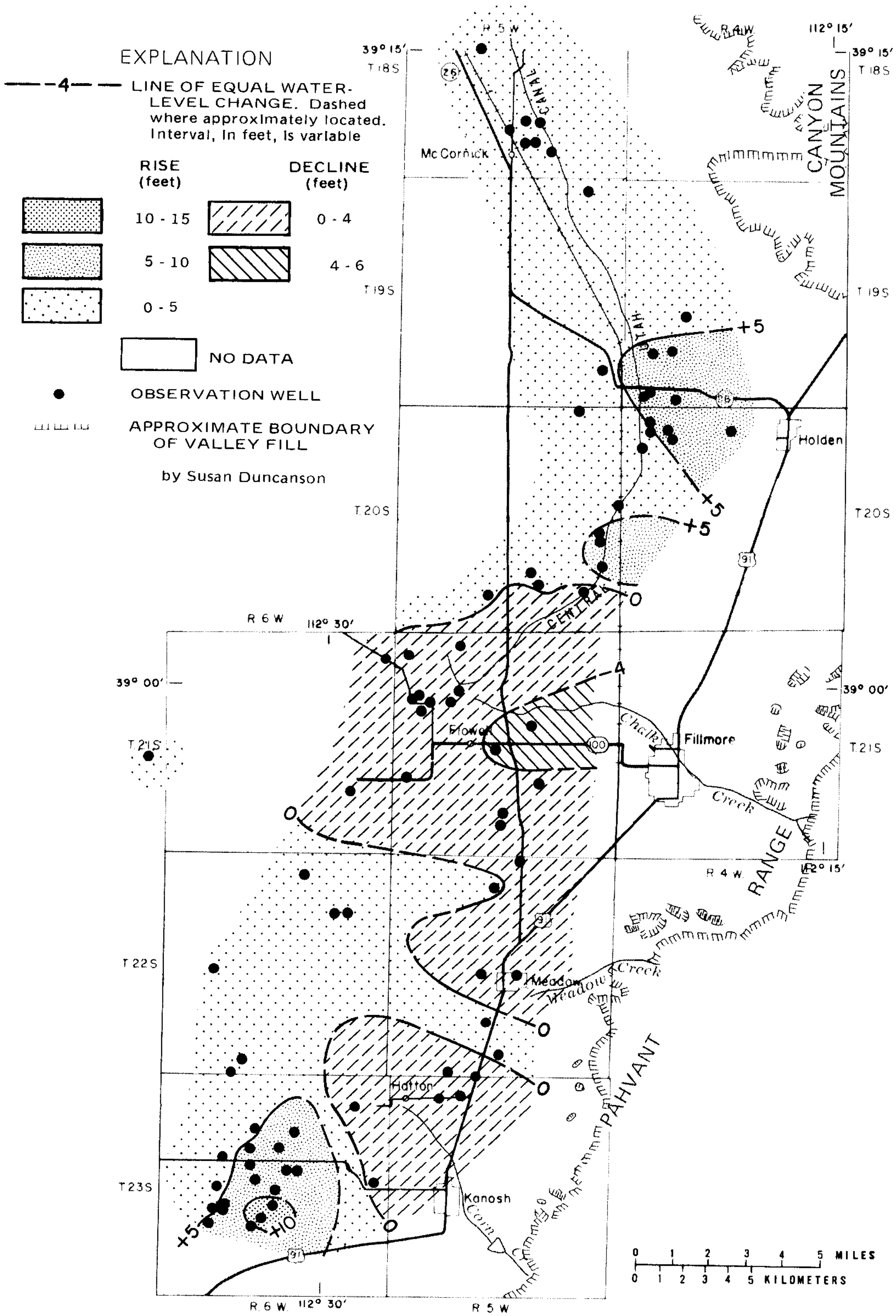


Figure 26.—Map of Pahvant Valley showing change of water levels from March 1985 to March 1986.

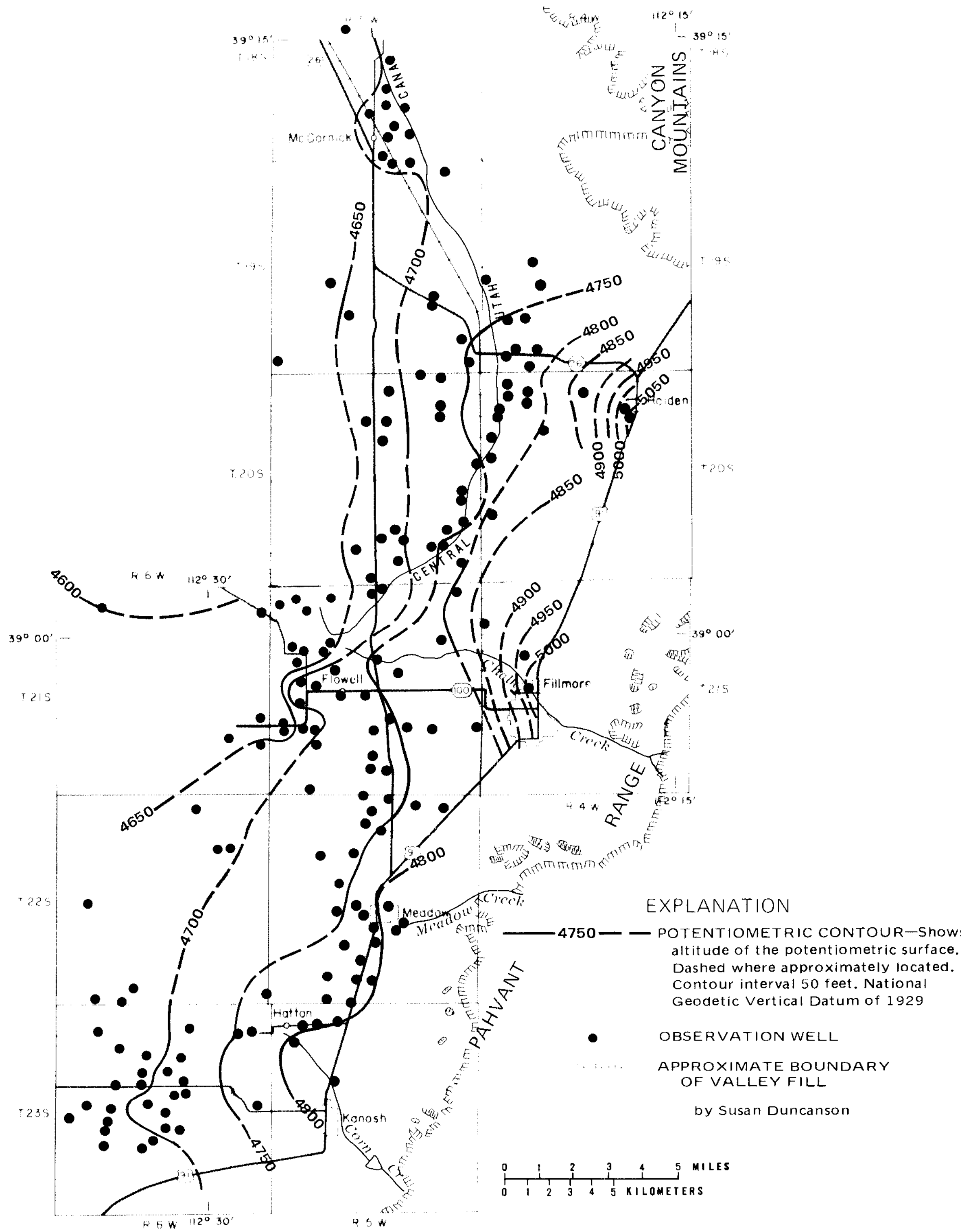


Figure 27.—Map of Pahvant Valley showing the approximate potentiometric surface, March 1986.

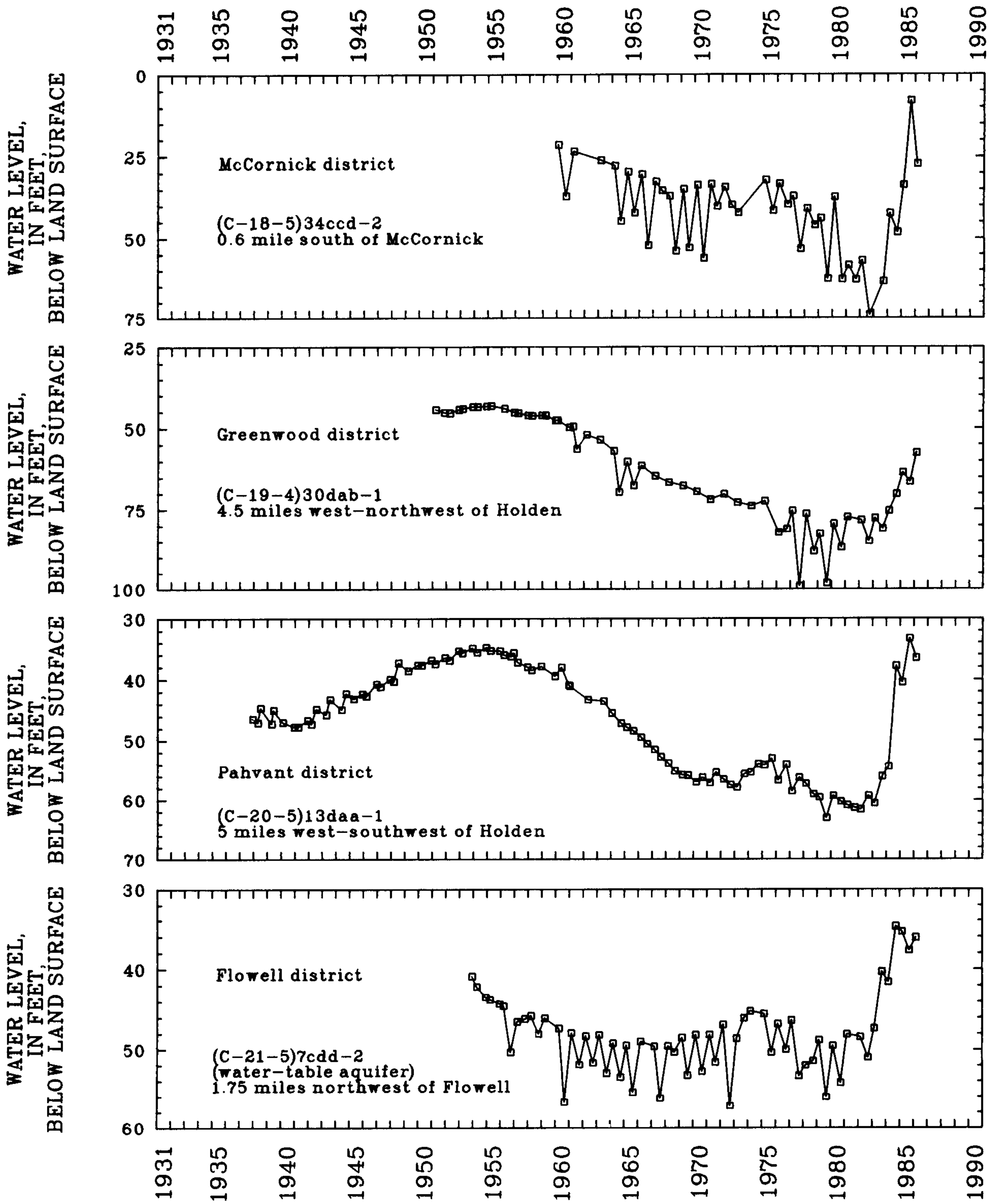


Figure 28.—Relation of water levels in selected wells in Pahvant Valley to cumulative departure from average annual precipitation at Fillmore and to annual withdrawals from wells.

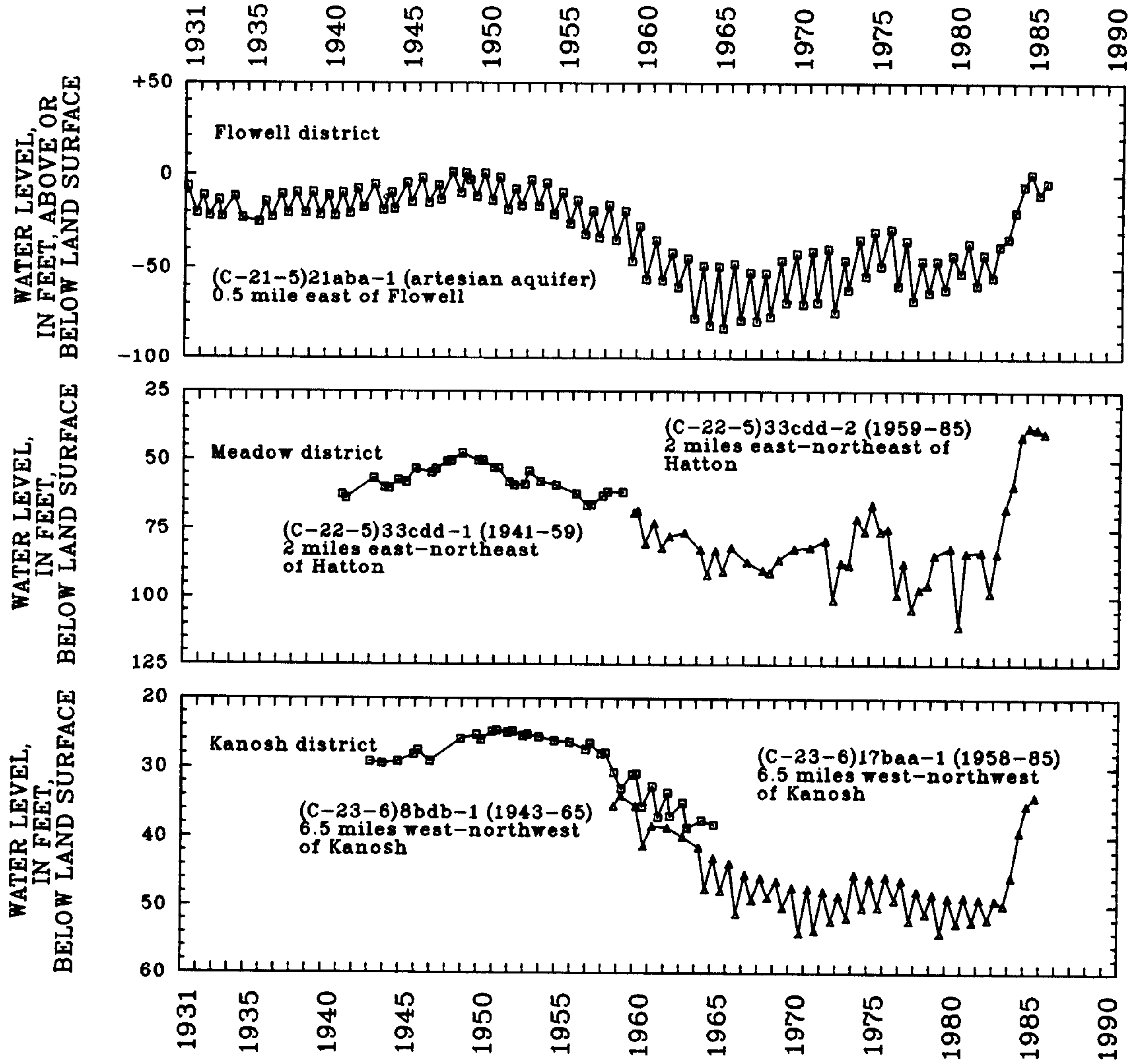


Figure 28.—Continued

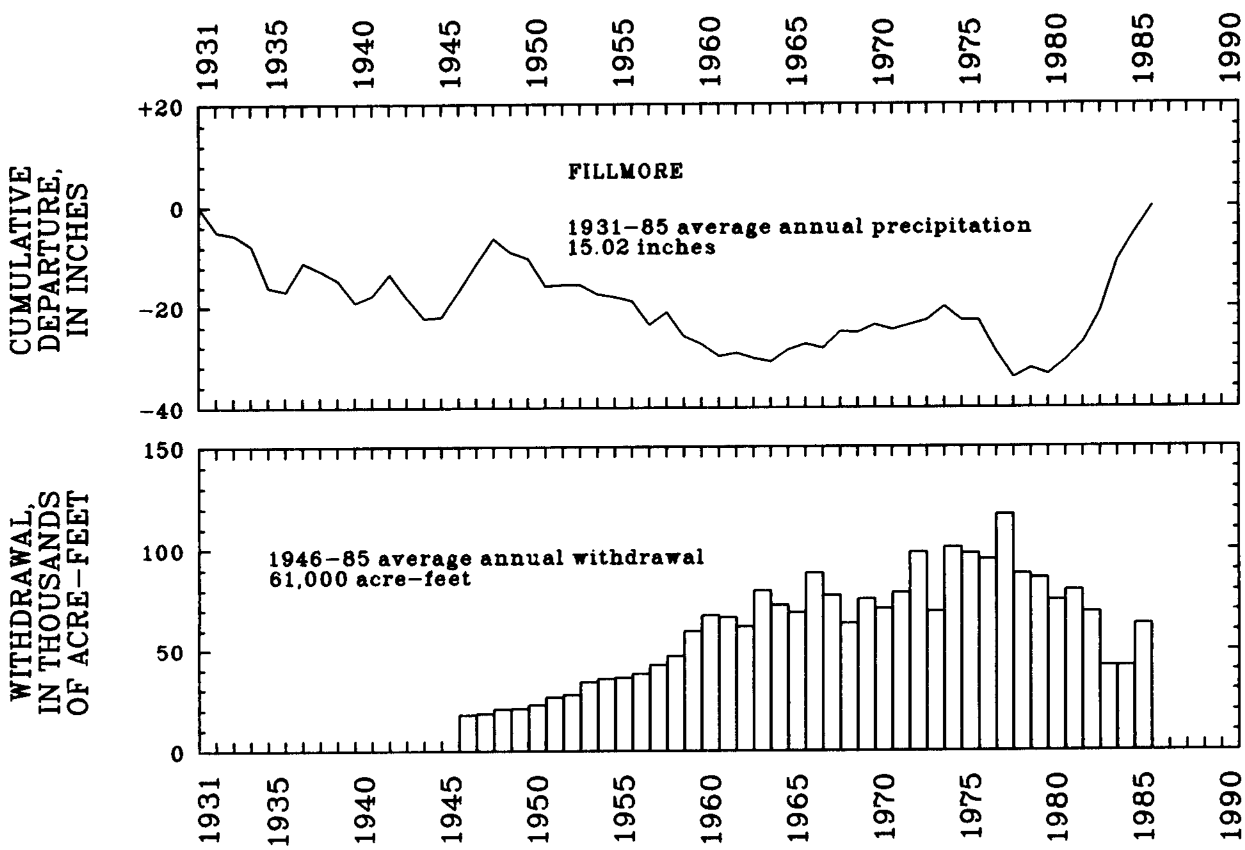


Figure 28.—Continued

CEDAR CITY VALLEY

by D. C. Emett

Withdrawal of water from wells in Cedar City Valley during 1985 was about 23,000 acre-feet, which is 3,000 acre-feet more than in 1984 and 6,000 acre-feet less than the average annual withdrawal for 1975-84 (table 2). Withdrawals for public supply decreased whereas withdrawals for irrigation increased.

Water levels rose in most of the valley from March 1985 to March 1986 (fig. 29). The largest rises, as much as 6 feet, occurred in a well north of Rush Lake and in a well north of Enoch. Declines of as much as 2 feet were measured northwest of Cedar City and southwest of Enoch in the center of the irrigated area. Declines of 2 feet were also measured around Kanarraville.

The relation of water levels in well (C-35-11)33aac-1 to precipitation at Cedar City Airport, discharge of Coal Creek, and annual withdrawals of water from wells is shown in figure 30. Discharge from Coal Creek was 30,500 acre-feet in 1985, 1,000 acre-feet more than in 1984, and 5,200 acre-feet more than the average annual discharge for 1939-85.

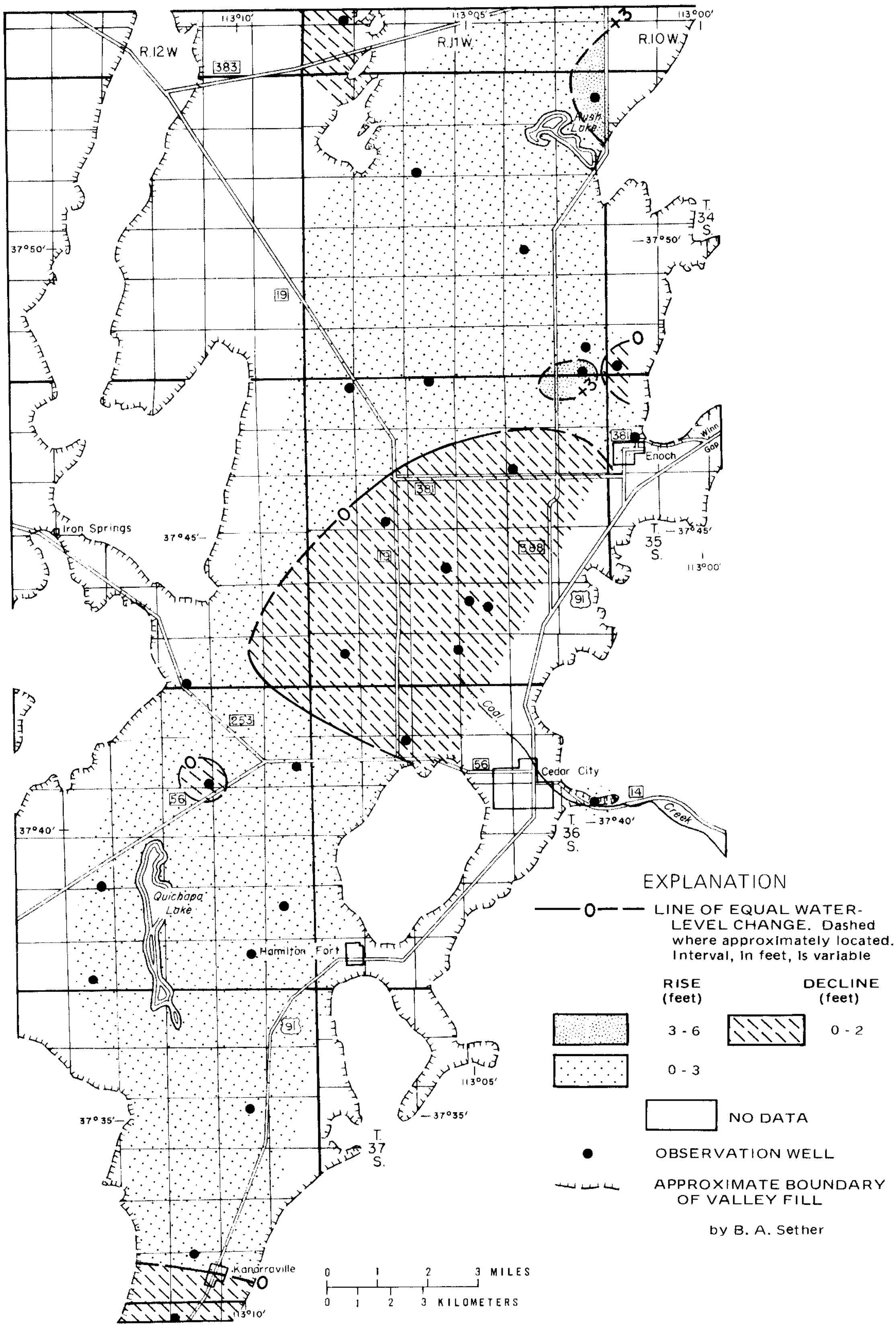


Figure 29.—Map of Cedar City Valley showing change of water levels from March 1985 to March 1986.

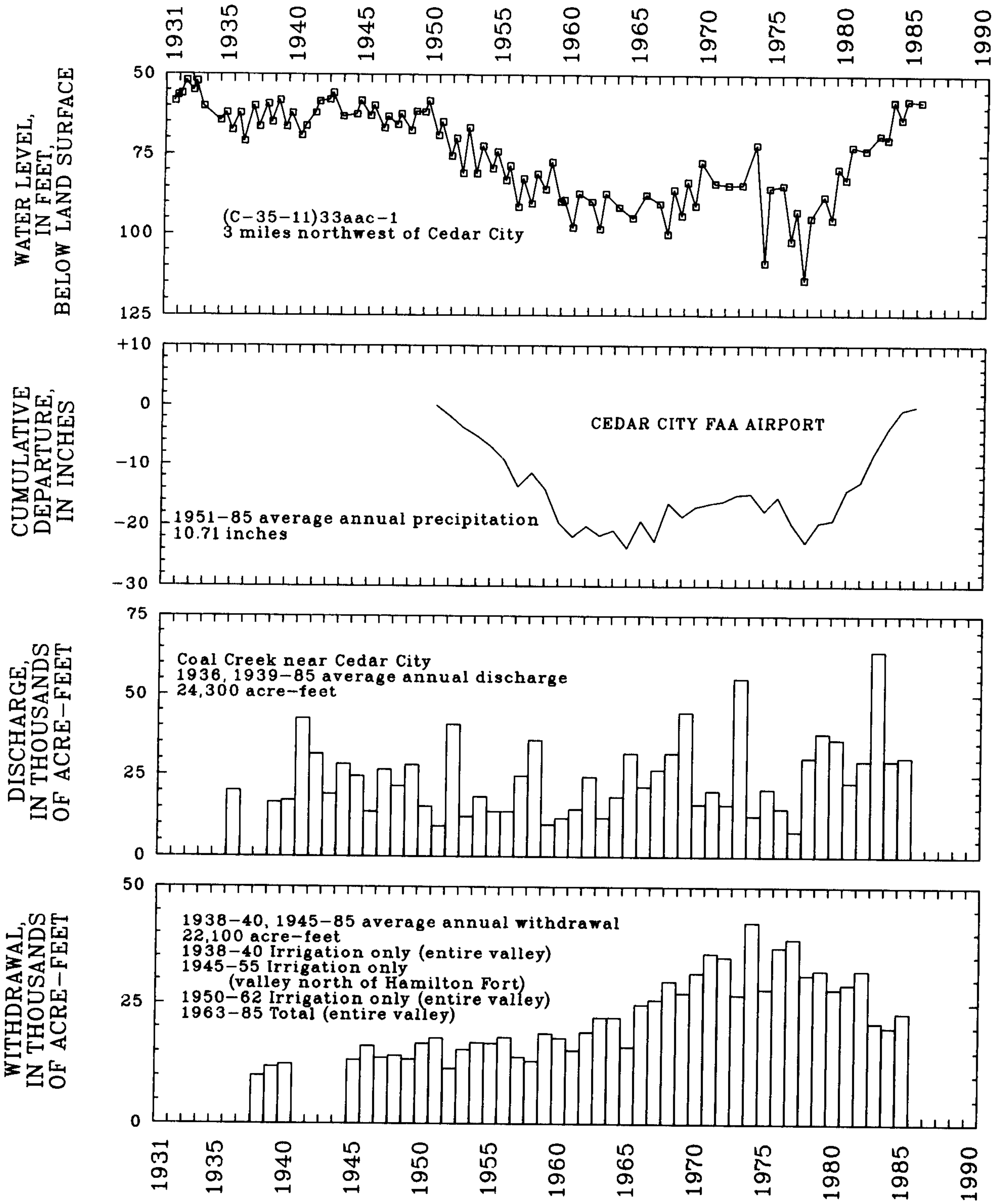


Figure 30.—Relation of water levels in well (C-35-11)33aac-1 in Cedar City Valley to cumulative departure from the average annual precipitation at the Cedar City FAA Airport, to discharge of Coal Creek near Cedar City, and to annual withdrawals from wells.

PAROWAN VALLEY

By G. W. Sandberg

Withdrawal of water from wells in Parowan Valley was about 25,000 acre-feet in 1985. This was approximately 3,000 acre-feet more than was reported in 1984 and 3,000 acre-feet less than the average annual withdrawal for 1975-84 (table 2). Withdrawals for irrigation increased whereas withdrawals for other uses remained about the same.

Water levels from March 1985 to March 1986 rose in most of the irrigated part of the valley, which is northwest of Parowan. The largest rises were near Parowan (fig. 31). The rises were due to above-average recharge from streamflow, which offset the effects of the larger withdrawals for irrigation since 1984.

The relation of water levels in well (C-34-8)5bca-1 to annual withdrawals from wells and cumulative departure from the average annual precipitation at Parowan Airport is shown in figure 32. The water level in well (C-34-8)5bca-1 remained nearly the same throughout the year. Precipitation in 1985 was 15.59 inches, which was 3.22 inches more than the average.

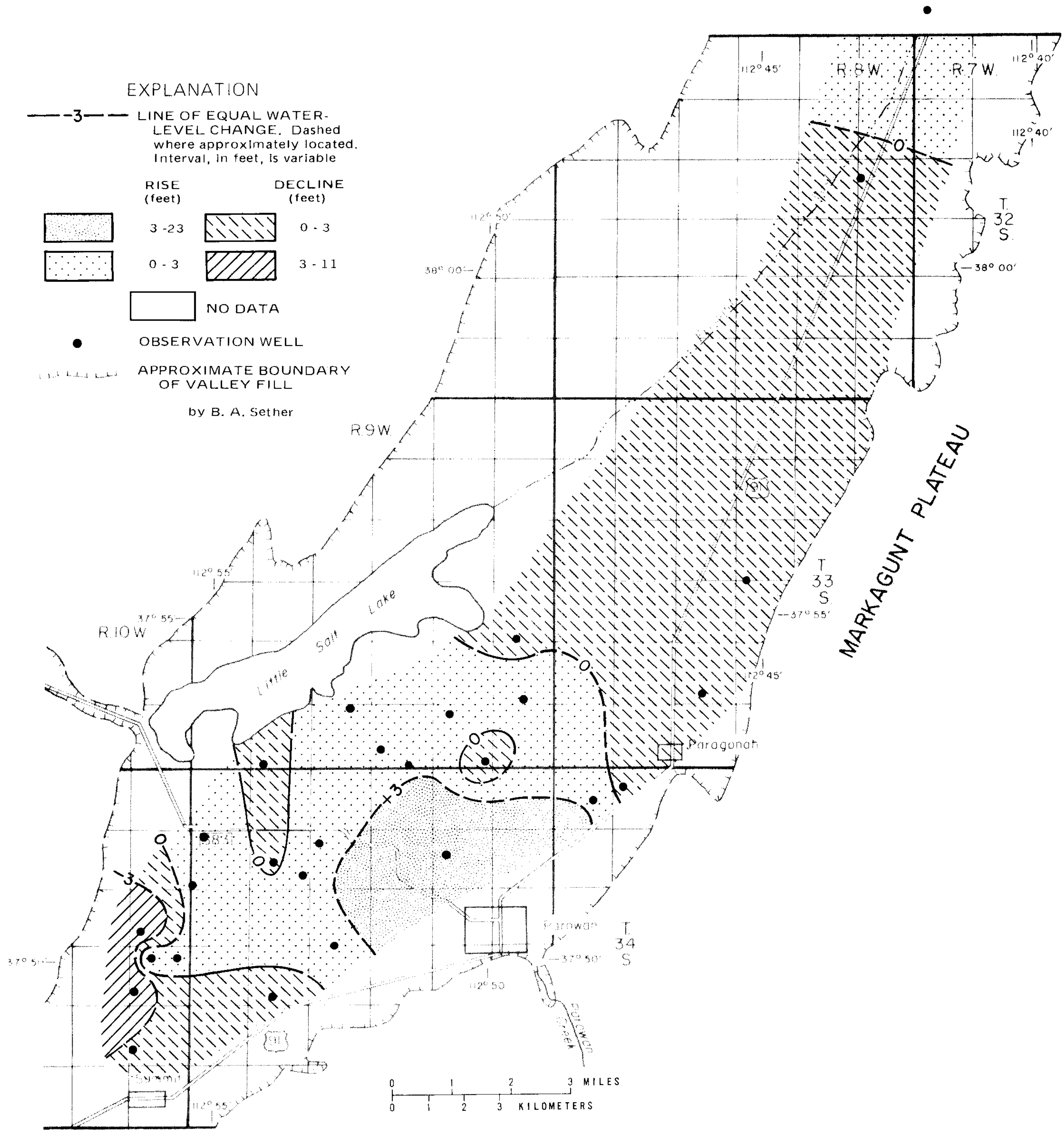


Figure 31.—Map of Parowan Valley showing change of water levels from March 1985 to March 1986.

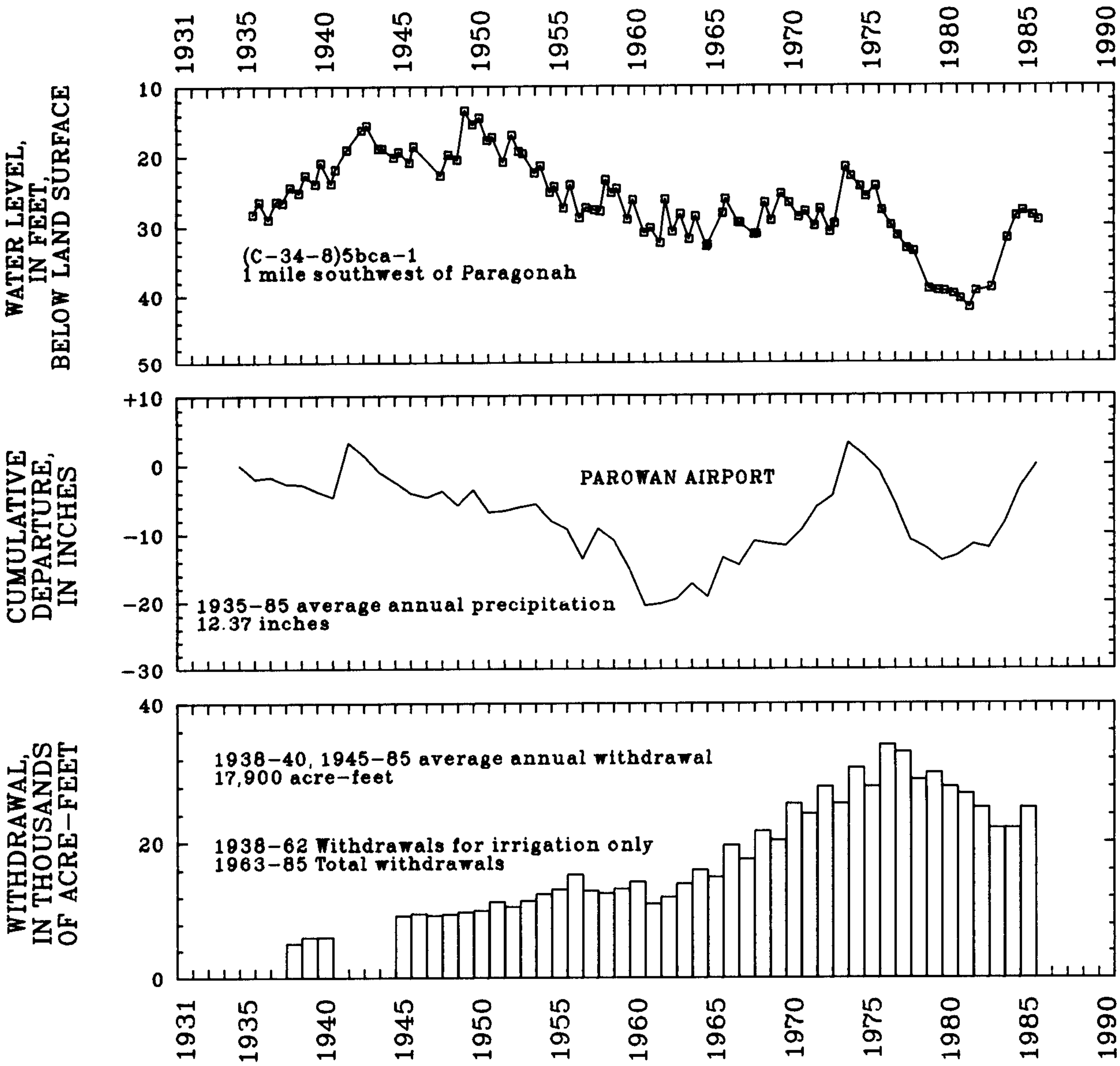


Figure 32.—Relation of water levels in well (C-34-8)5bca-1 in Parowan Valley to cumulative departure from the average annual precipitation at Parowan Airport and to annual withdrawals from wells.

ESCALANTE VALLEY

Milford area

by R. W. Puchta

Withdrawal of water from wells in the Milford area in 1985 was about 44,000 acre-feet, which is 12,000 acre-feet more than the 1984 withdrawal, and 11,000 acre-feet less than the 1975-84 average annual withdrawal (table 2). The increased withdrawal from wells was due to increased withdrawals for irrigation. The discharge from the Beaver River was 57,100 acre-feet in 1985, 37,700 acre-feet less than the previous year, but 19,800 acre-feet more than the 1931-85 average annual discharge.

Water levels declined in most of the pumped area from March 1985 to March 1986. Declines of nearly 10 feet occurred in the center of this area (fig. 33). Water levels rose slightly in the rest of the Milford area, with rises of almost 4 feet in a small area northwest of Minersville.

The relation of water levels in well (C-29-10)6ddc-2 to precipitation at Milford Airport, discharge of Beaver River at Rocky Ford Dam, and annual withdrawals of water from wells is shown in figure 34. Precipitation at the Milford Airport for 1985 was 11.21 inches, which was 2.28 inches above the average.

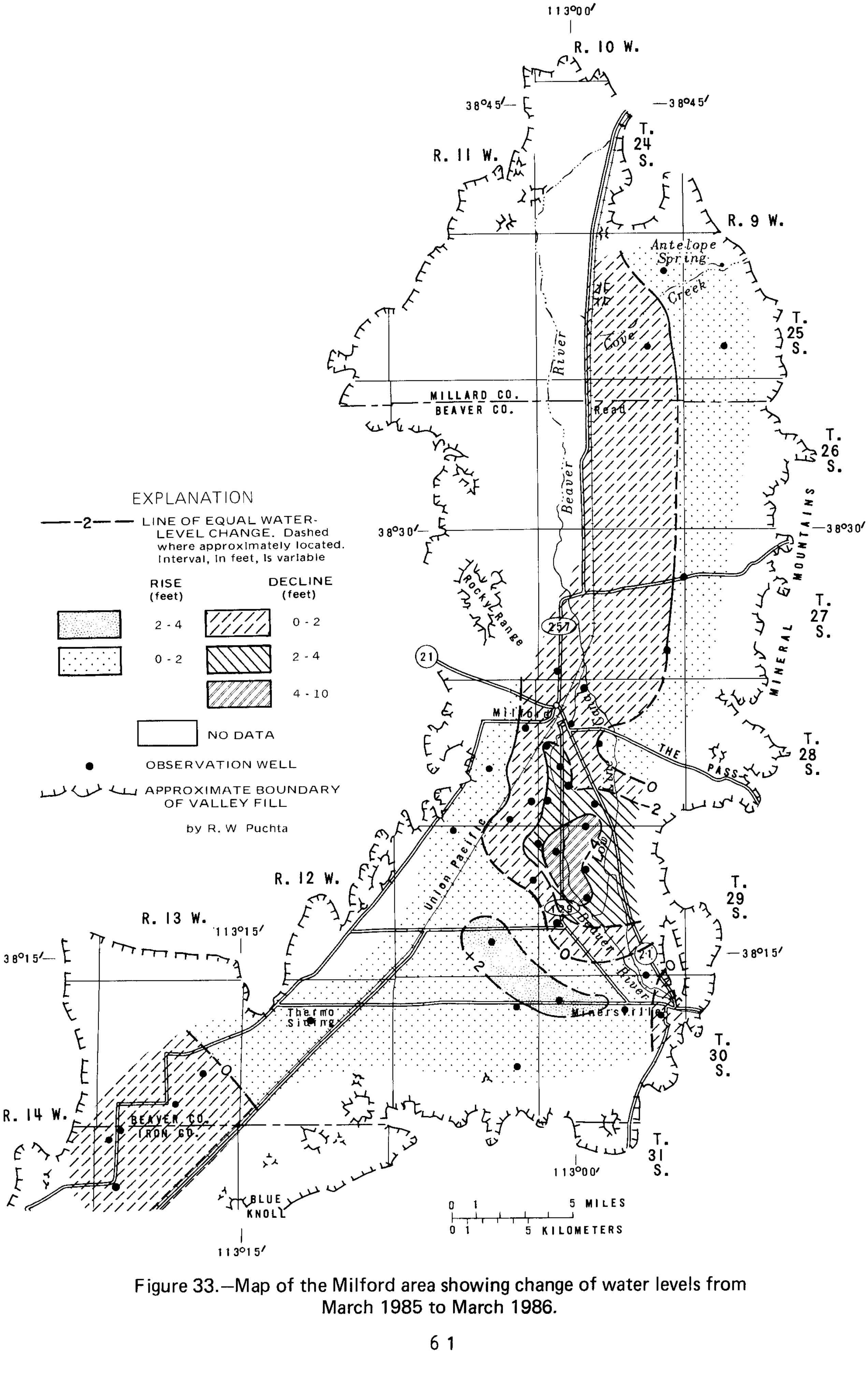


Figure 33.—Map of the Milford area showing change of water levels from March 1985 to March 1986.

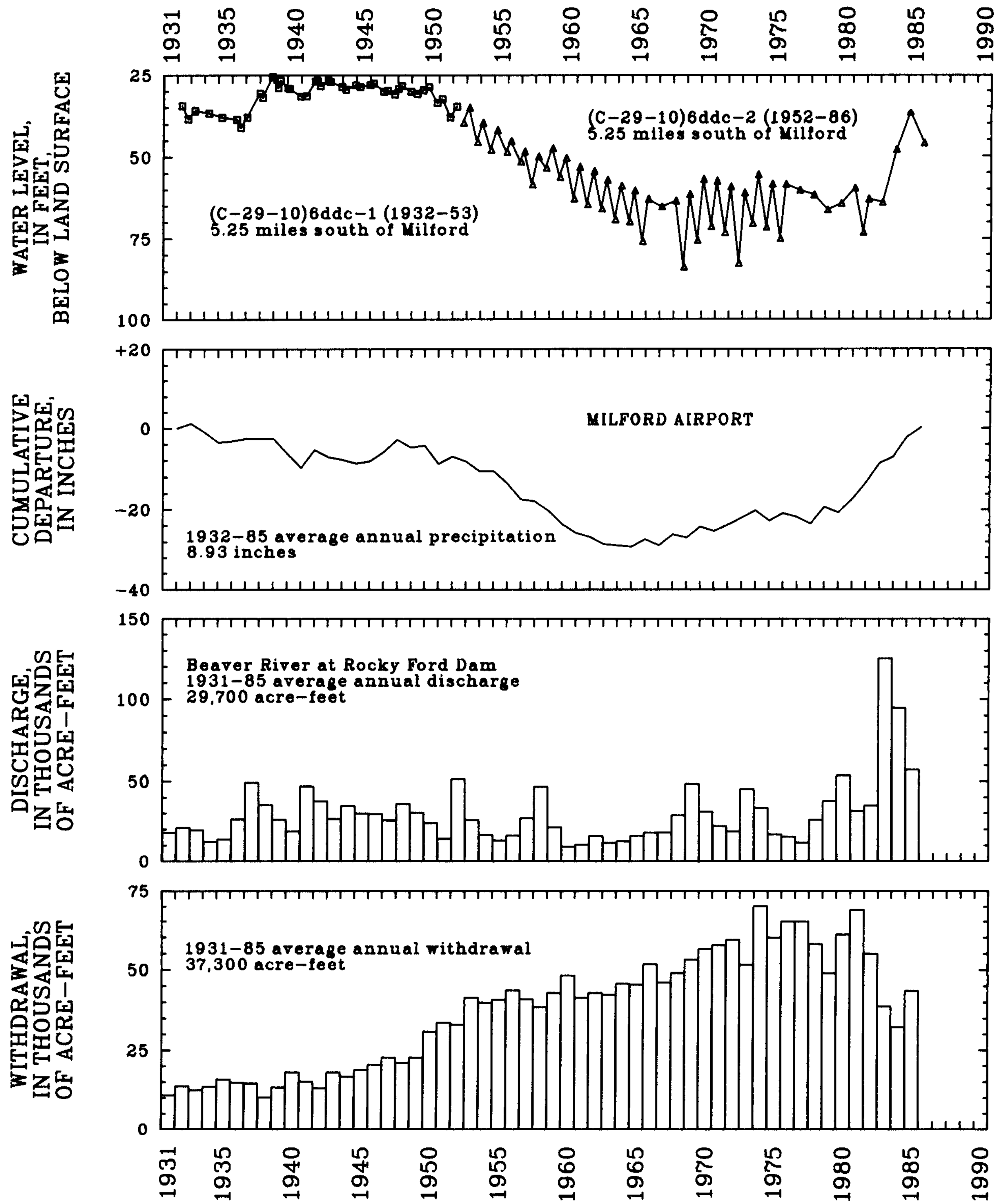


Figure 34.—Relation of water levels in well (C-29-10)6ddc-2 in the Milford Area, to cumulative departure from the average annual precipitation at Milford Airport, to discharge of the Beaver River at Rocky Ford Dam, and to annual withdrawals from wells.

ESCALANTE VALLEY

Beryl-Enterprise area

By G. W. Sandberg

Withdrawal of water from wells in the Beryl-Enterprise area in 1985 was about 100,000 acre-feet, an increase of 5,000 acre-feet from the 1984 withdrawal, and an increase of 16,000 acre-feet from the average annual withdrawal for 1975-84 (table 2). Ground-water withdrawals for irrigation increased whereas withdrawals for industrial use decreased. Most of the water withdrawn for industrial use, about 19,000 acre-feet, was for dewatering a mine. Except for minor losses due to evaporation, that water was returned to the ground-water reservoir as recharge in an adjacent area.

Water levels declined from March 1985 to March 1986 in nearly all of the Beryl-Enterprise area due to continued large withdrawals (fig. 35). Water levels rose slightly in a small area around Enterprise due to recharge from Shoal Creek.

The relation of water levels in well (C-35-17)25dcd-1 to annual withdrawal from wells and cumulative departure from the average annual precipitation at Modena is shown in figure 36, and variations of dissolved-solids in water from selected wells are shown in figure 37. The water level in well (C-35-17)25dcd-1 continued to decline in spite of recent above normal precipitation as recorded at Modena. Concentration of dissolved solids in well (C-34-16)28dcc-2 (the only well from which water was sampled for analysis in 1985) in the northern part of the pumped area increased from 1984.

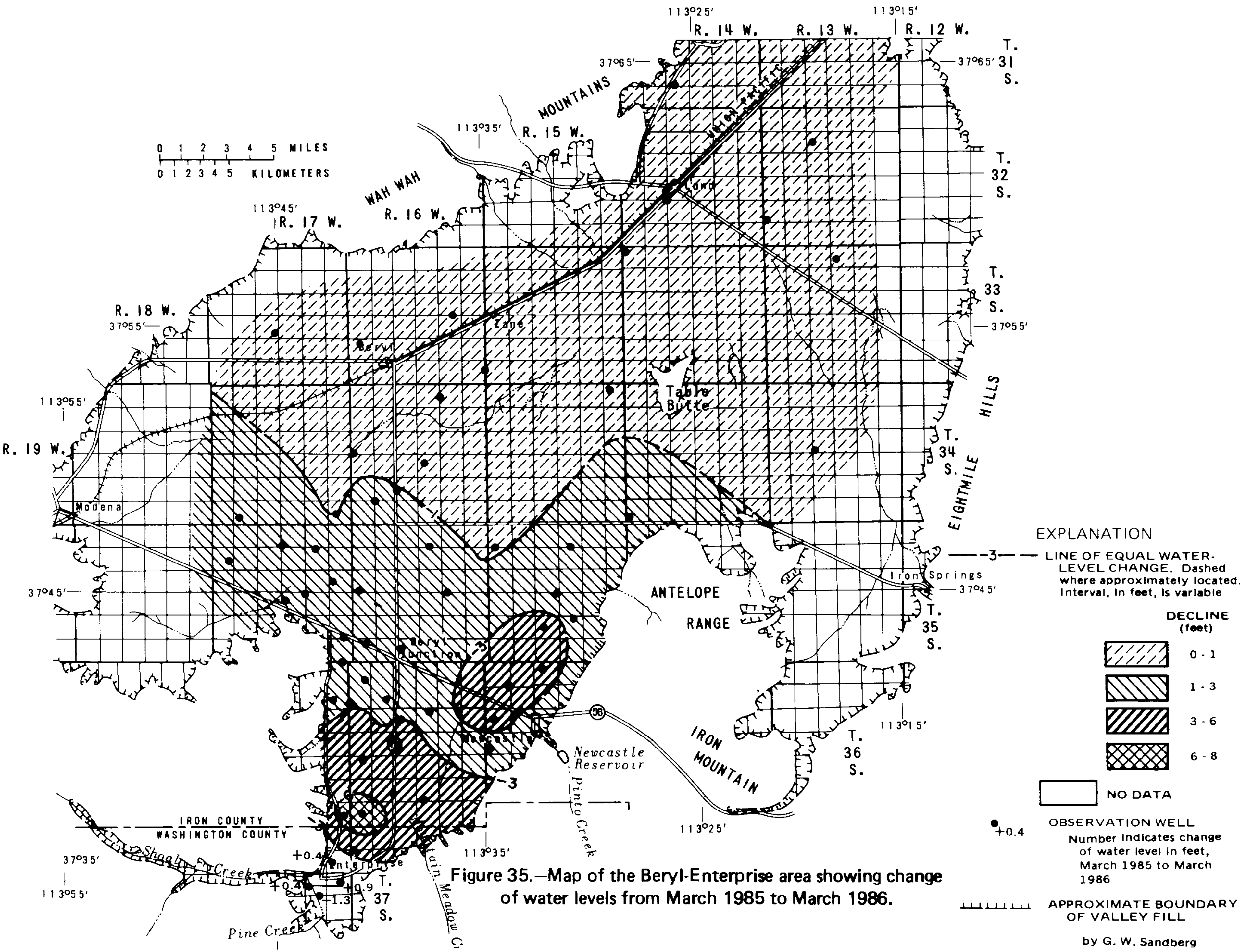


Figure 35.—Map of the Beryl-Enterprise area showing change of water levels from March 1985 to March 1986.

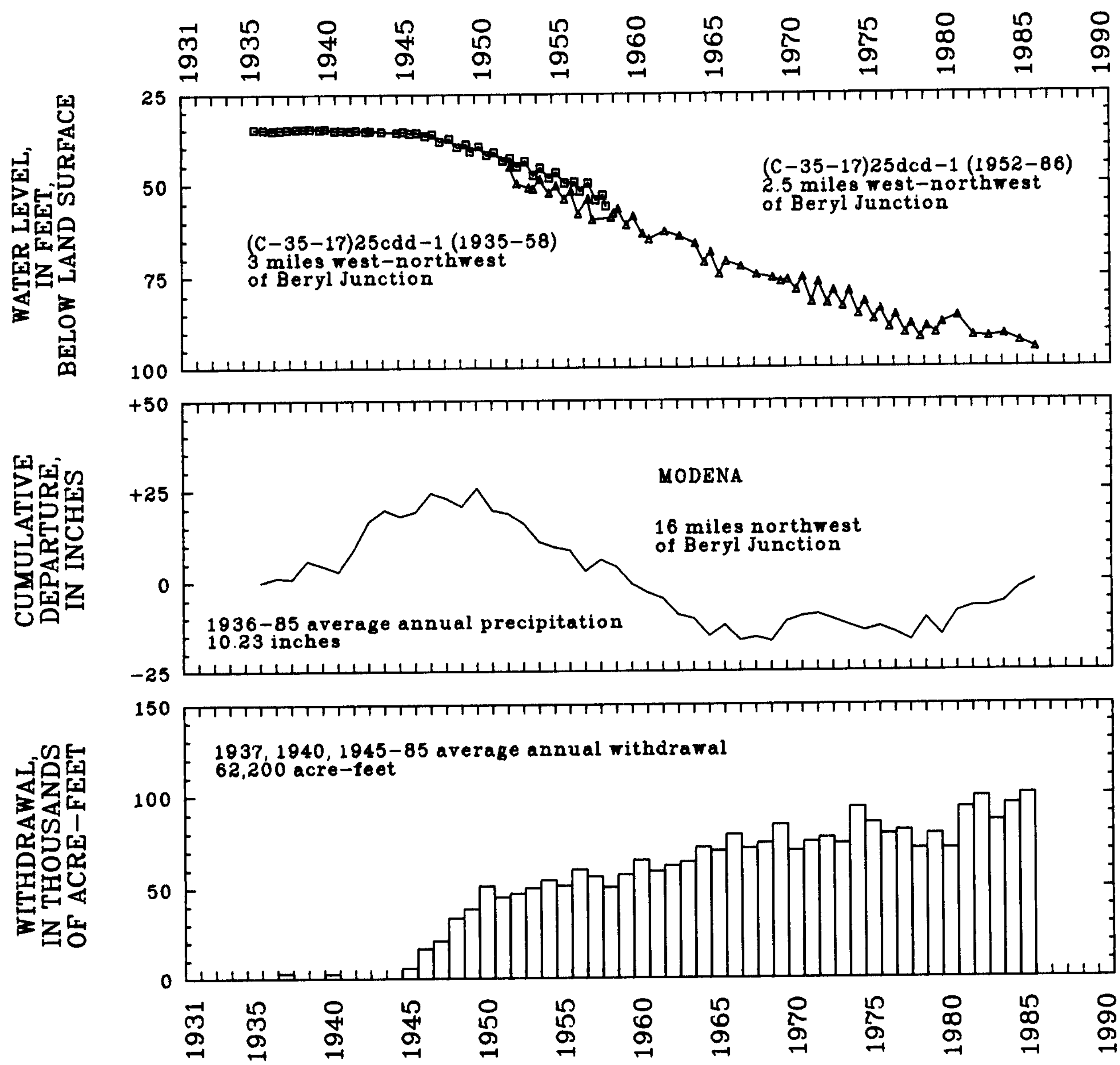


Figure 36.—Relation of water levels in well (C-35-17)25dcd-1 in the Beryl-Enterprise area to cumulative departure from the average annual precipitation at Modena and to annual withdrawals from wells.

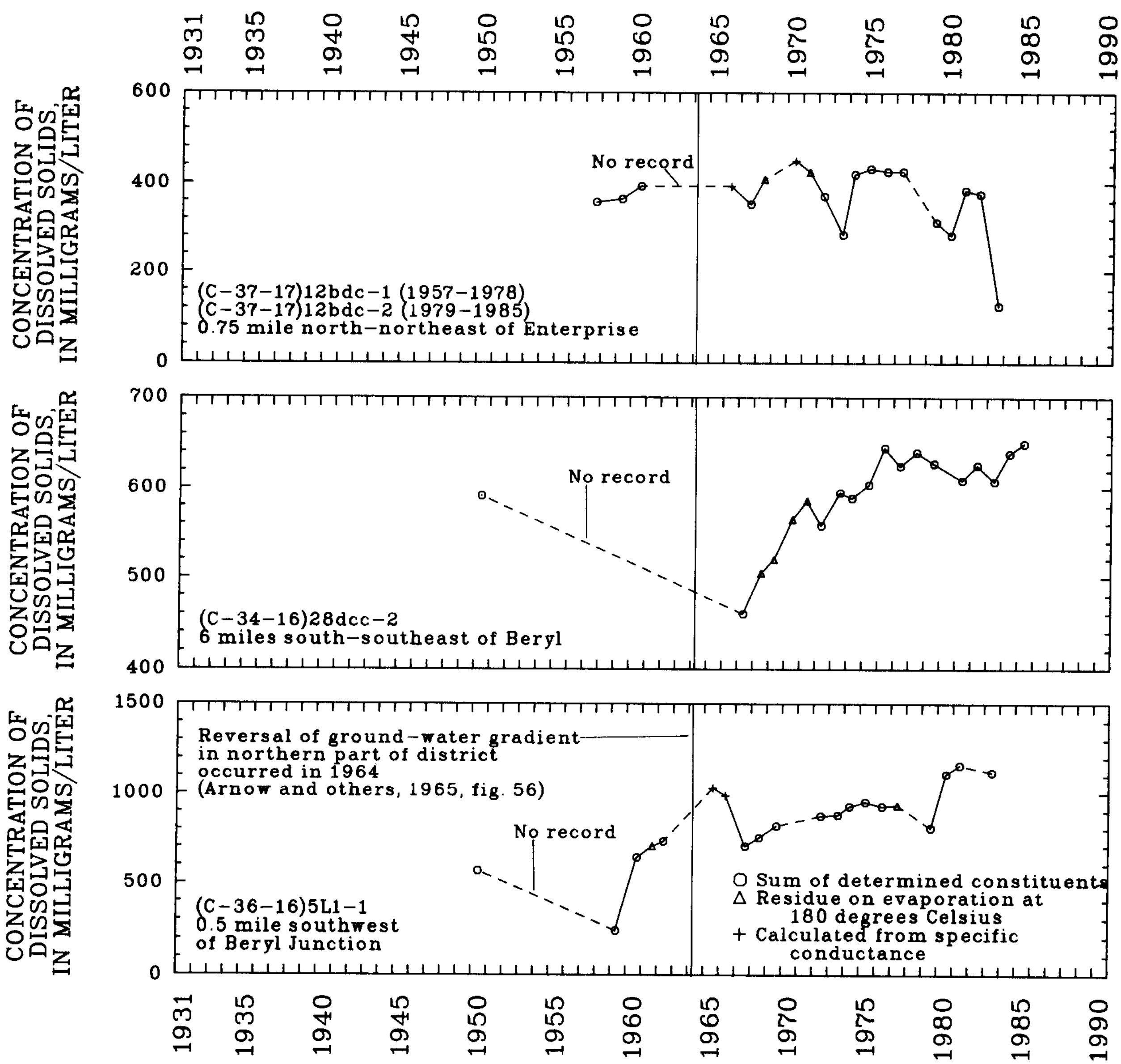


Figure 37.—Concentration of dissolved solids in water from selected wells in the Beryl–Enterprise area.

CENTRAL VIRGIN RIVER AREA

by G. W. Sandberg

Withdrawal of water from wells in the Central Virgin River area was approximately 21,000 acre-feet in 1985, 2,000 acre-feet more than reported for 1984 and 2,000 acre-feet more than the 1975-84 average annual withdrawal (table 2). Withdrawal for irrigation decreased slightly whereas withdrawal for public supply increased. This can be attributed to the conversion of land from agricultural to urban use.

Water levels rose in 10 wells and declined in 12 wells from February 1985 to February 1986 (fig. 38). The largest observed rise occurred about 4 miles southeast of St. George and the largest decline occurred about 6 miles southeast of St. George.

The relation of water levels in selected wells to discharge of the Virgin River at Virgin and precipitation at St. George is shown in figure 39. Precipitation at St. George was 7.45 inches and was below average for the second year in a row. Discharge in the Virgin River at Virgin was the lowest of record since 1931.

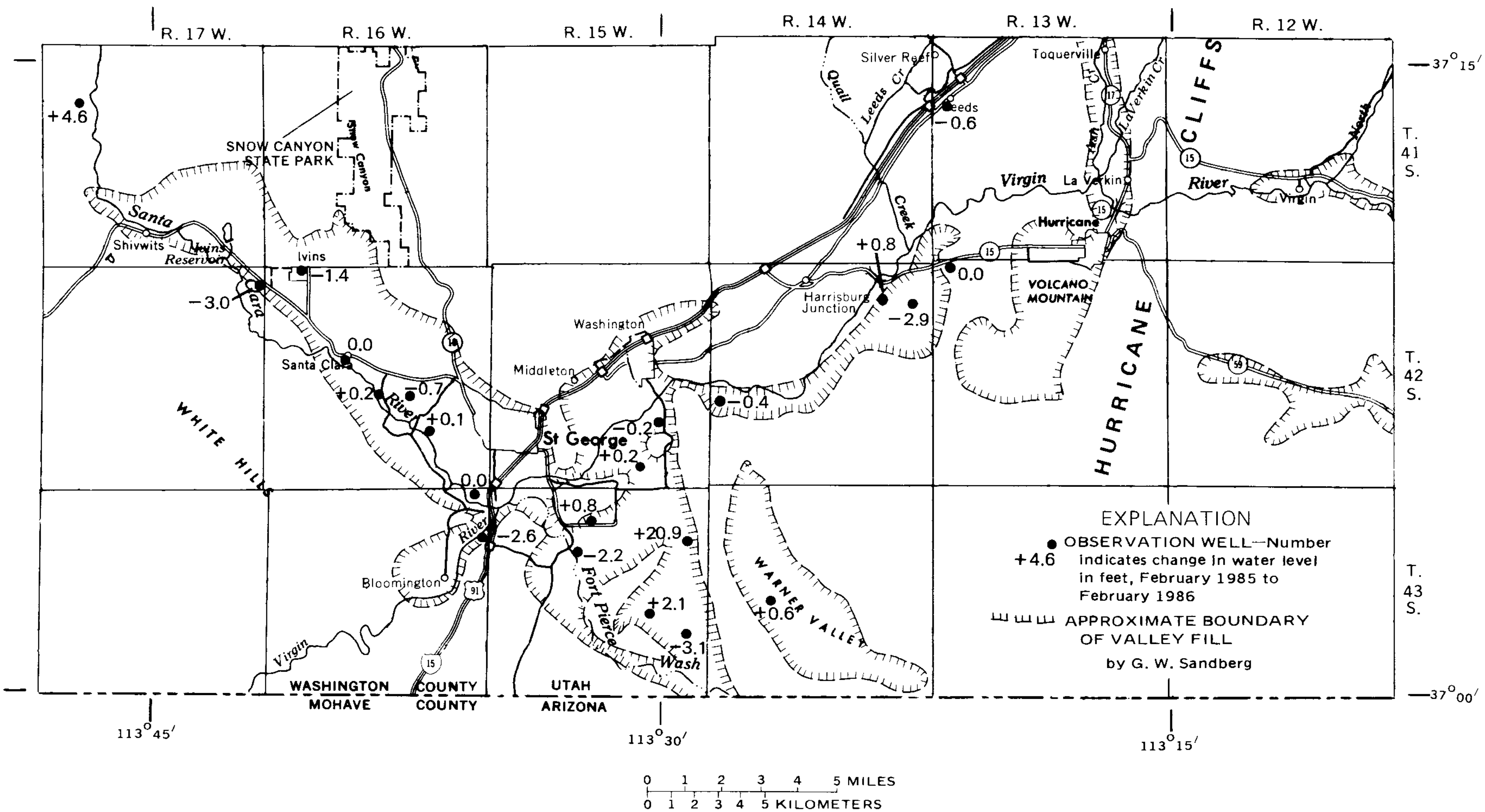


Figure 38.—Map of the Central Virgin River area showing change of water levels from February 1985 to February 1986.

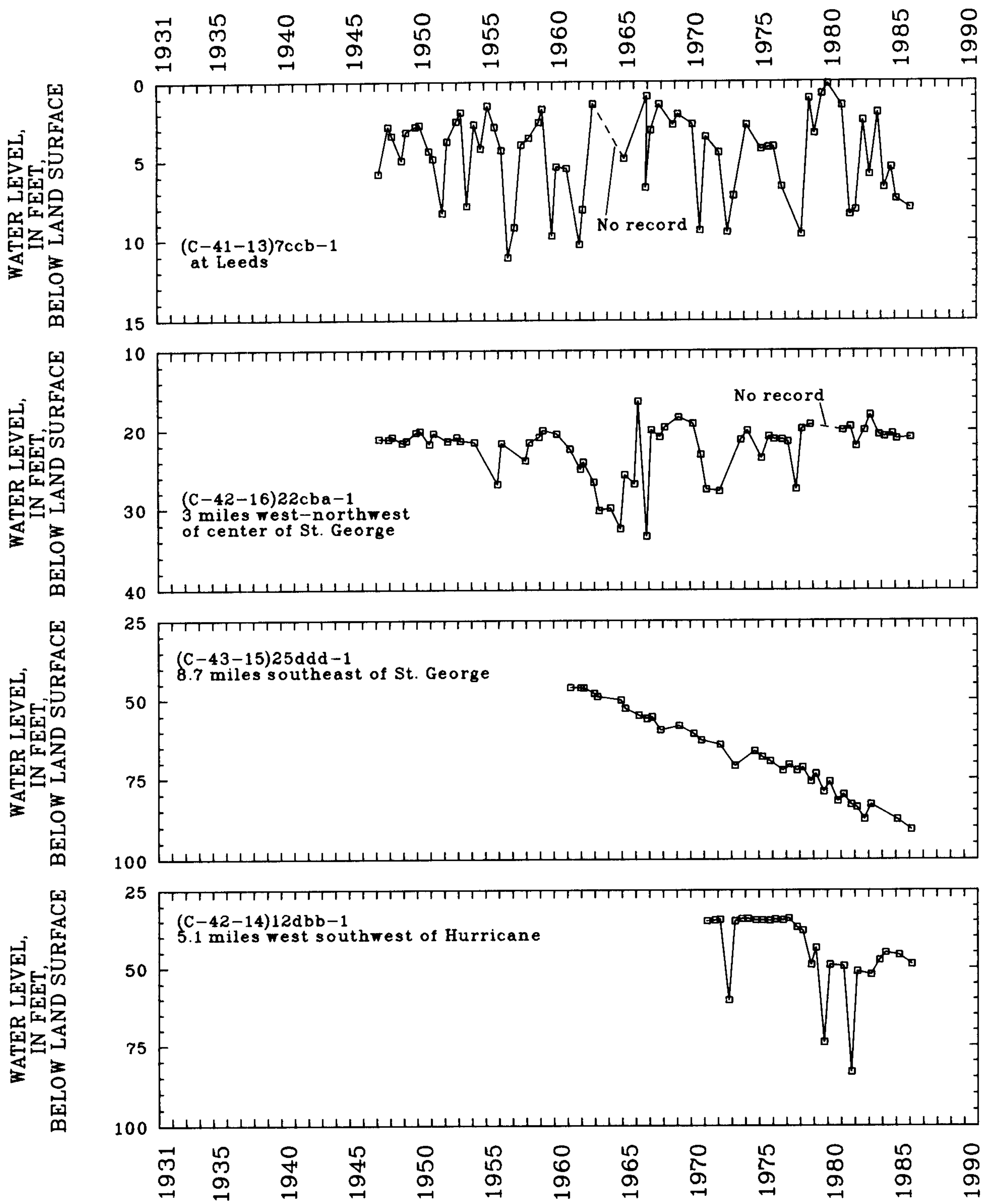


Figure 39.—Graphs showing relation of water levels in selected wells to discharge of the Virgin River at Virgin, to cumulative departure from average annual precipitation at Saint George, and to annual withdrawals from wells in the Central Virgin River area.

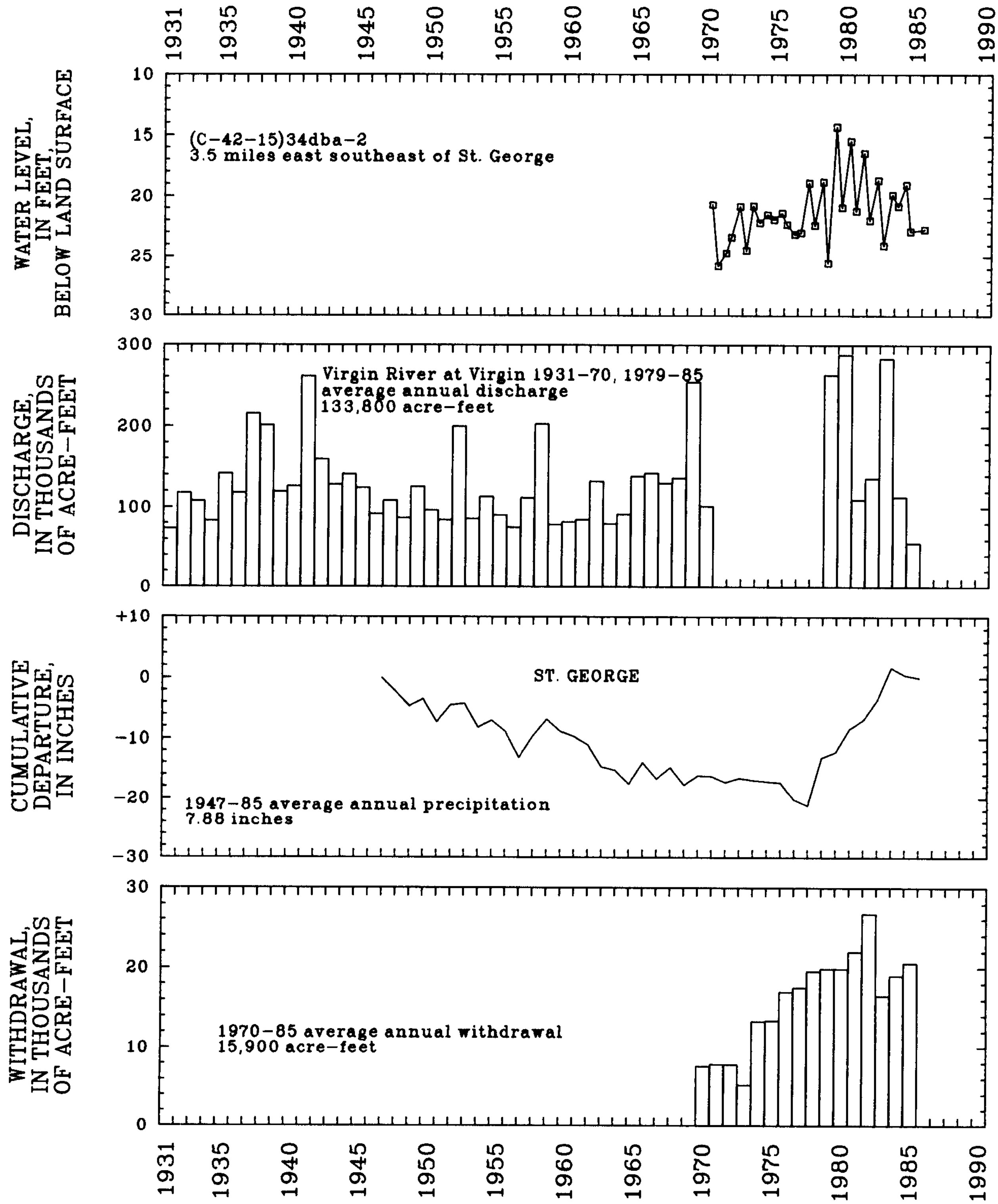


Figure 39.—Continued

OTHER AREAS

by L. R. Herbert

Approximately 77,000 acre-feet of water was withdrawn from wells in 1985 in those areas of Utah listed below:

Number in figure 1	Area	Estimated withdrawal (acre-feet) 1985	1984
1	Grouse Creek valley	3,000	1,600
2	Park Valley	1,600	1,100
8	Ogden Valley	10,000	9,500
12	Dugway area Skull Valley Old River Bed	6,100	2,000
13	Cedar Valley	2,000	2,100
18	Sanpete Valley	5,100	6,800
23	Snake Valley	7,800	7,000
25	Beaver Valley	7,200	7,100
	Remainder of State	34,500	26,800
Total (rounded)		77,000	64,000

The total withdrawal was 13,000 acre-feet more than in 1984 and 5,000 acre-feet less than the average withdrawal for 1975-84 (table 2). In the areas listed, withdrawals in 1985 were greater than in 1984 except in Cedar Valley and Sanpete Valley. The increase in withdrawals was due mainly to increased withdrawals for industrial use, although withdrawals for all other types of water use also increased.

Figure 40 shows the water-level hydrographs of 16 selected obsevation wells, cumulative departure from average annual precipitation at sites in or near the areas in which the wells are located, and total withdrawals from wells in "Other areas". Water levels rose in 6 of the wells from March 1985 to March 1986. The rises were due to above average precipitation. In contrast, water levels declined in 10 wells from March 1985 to March 1986. The declines generally were due to increased withdrawals and below average precipitation in some areas.

Figures 41 and 42 show changes of water levels in Cedar and Sanpete Valleys from March 1985 to March 1986. Water levels generally rose in Cedar Valley due to above average precipitation and decreased withdrawals for irrigation. Water levels in Sanpete Valley generally rose in the northern part but declined in the southern part of the valley, although withdrawals decreased and precipitation was above average.

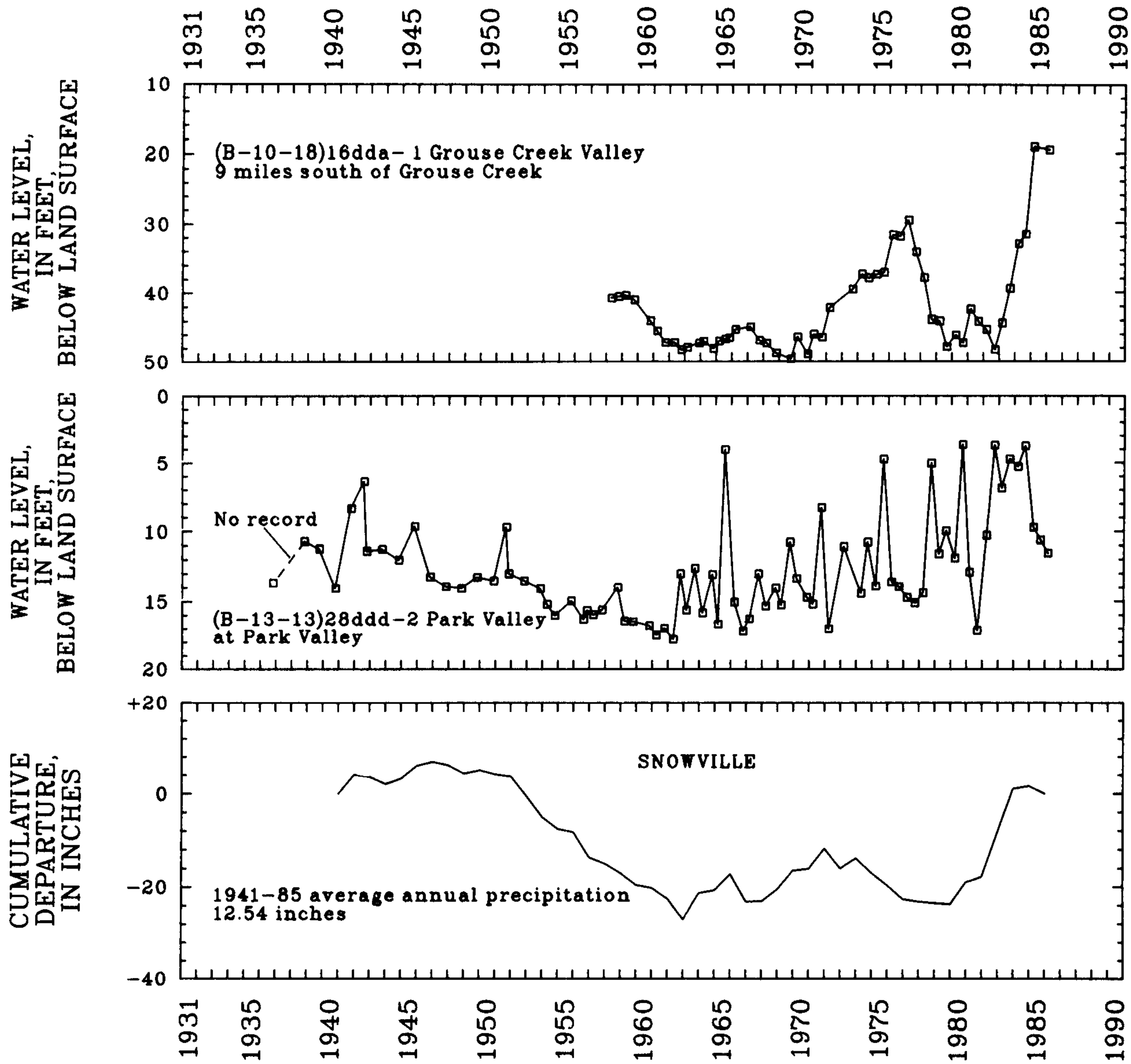


Figure 40.—Relation of water levels in wells in selected areas of Utah to cumulative departure from the average annual precipitation at sites in or near those areas, and total withdrawals from wells in "Other areas."

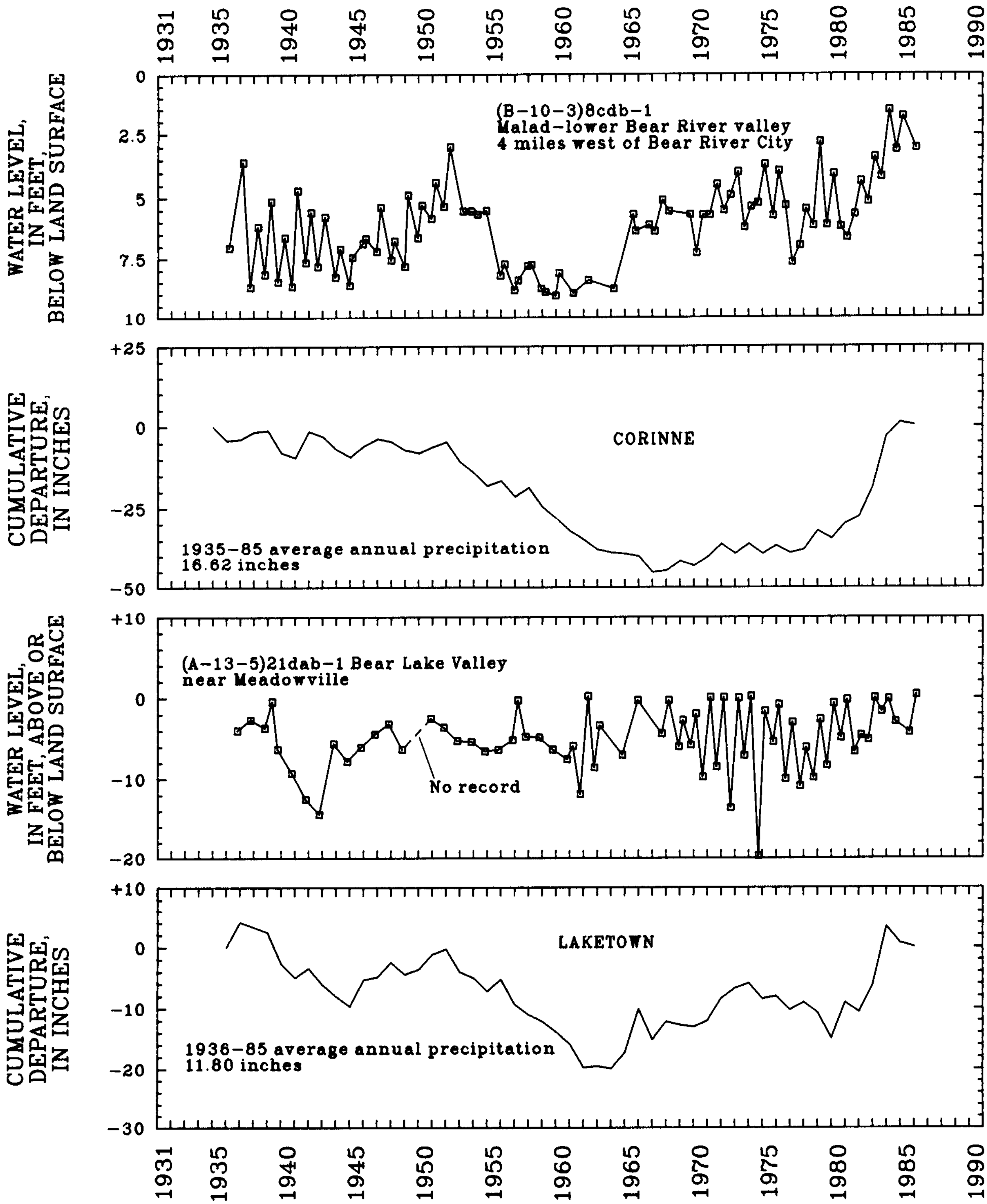


Figure 40.—Continued

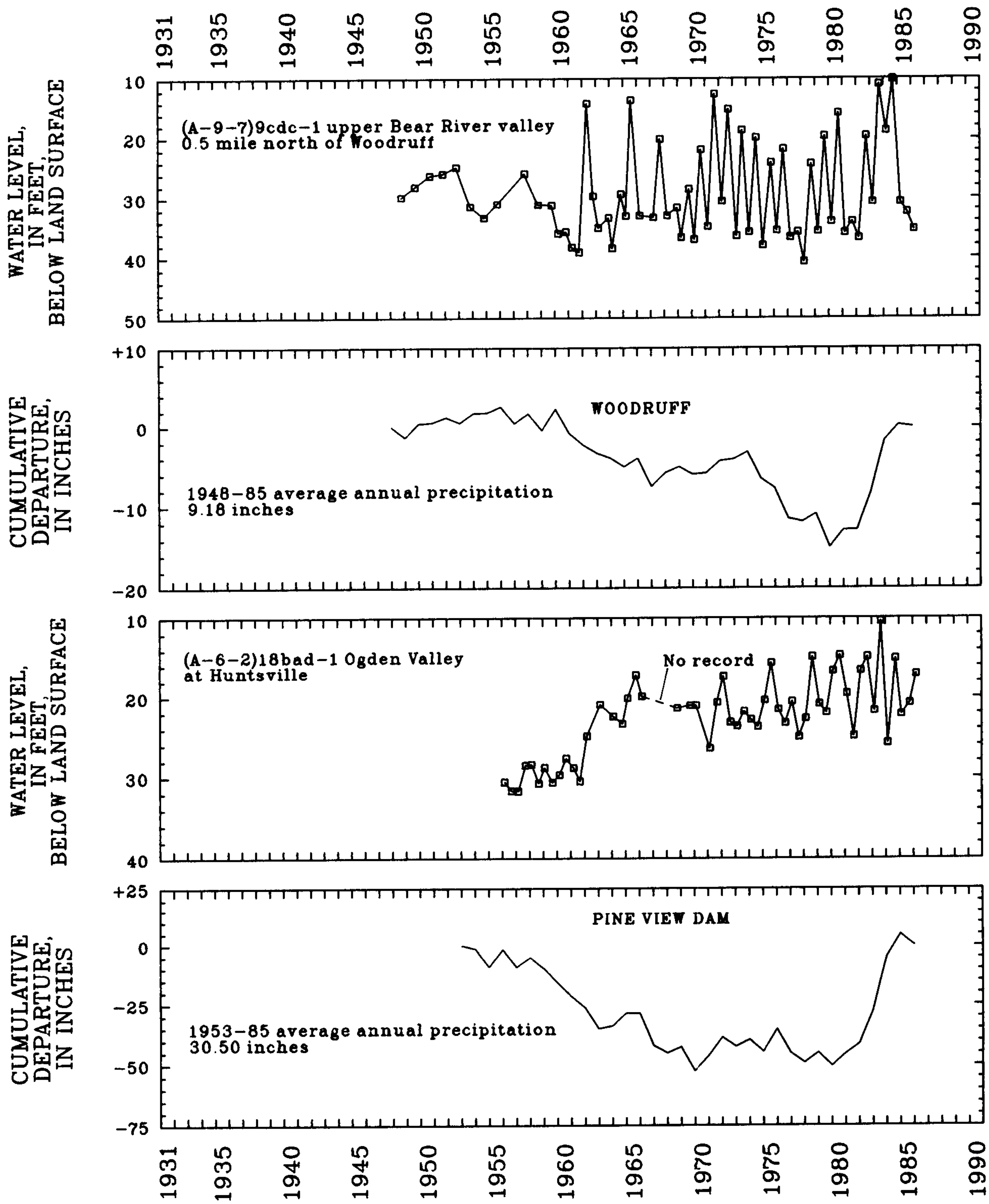
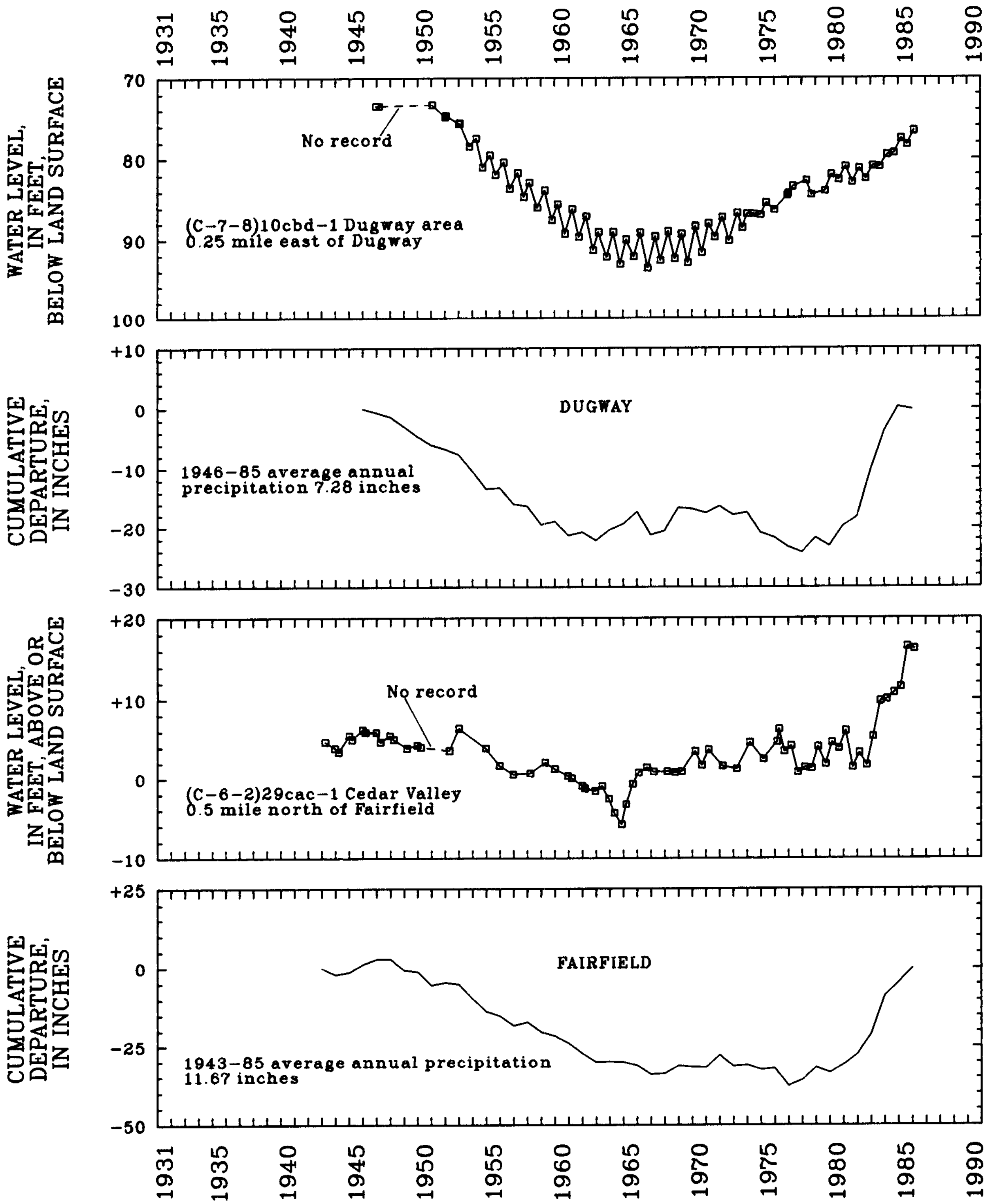


Figure 40.—Continued



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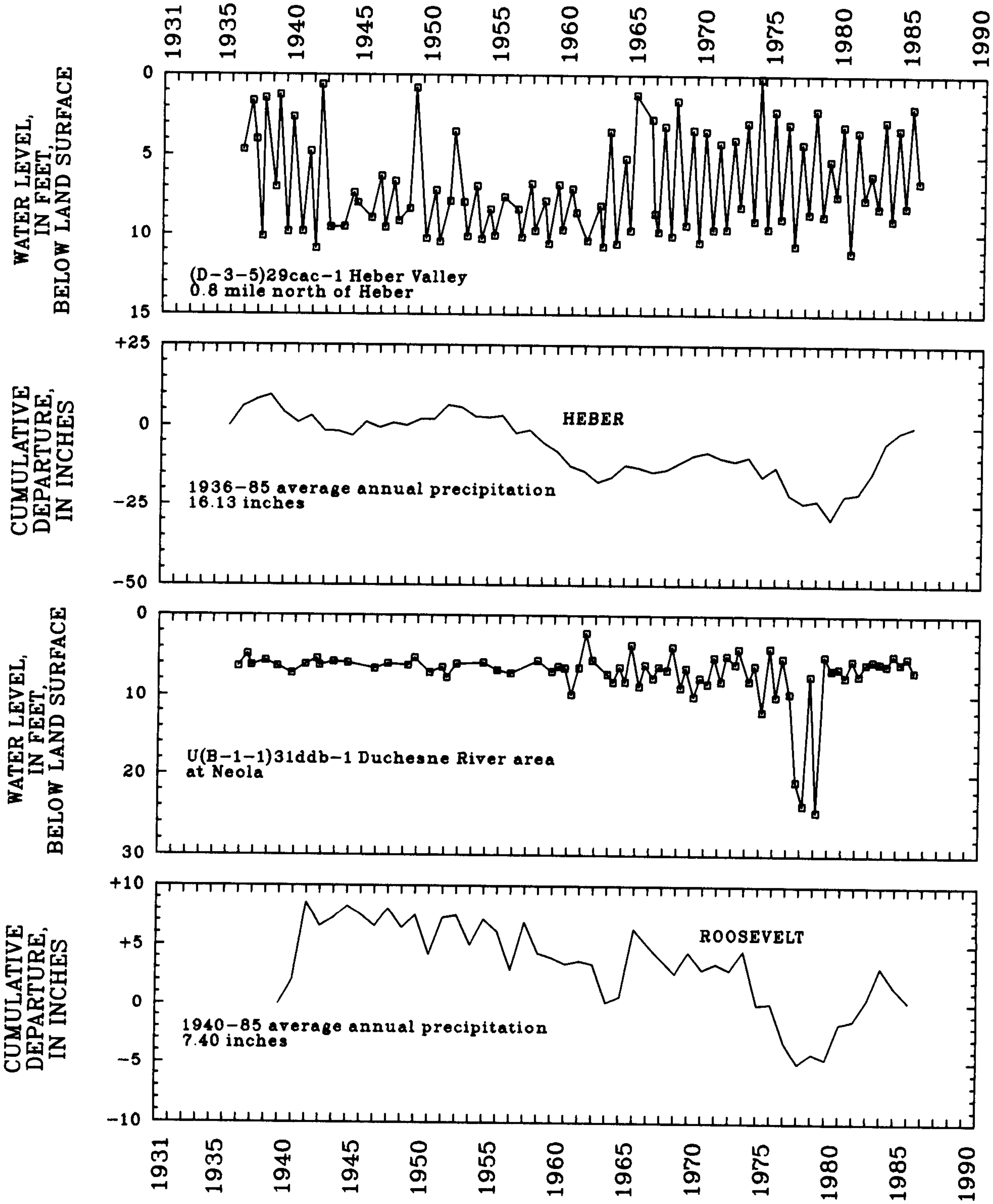

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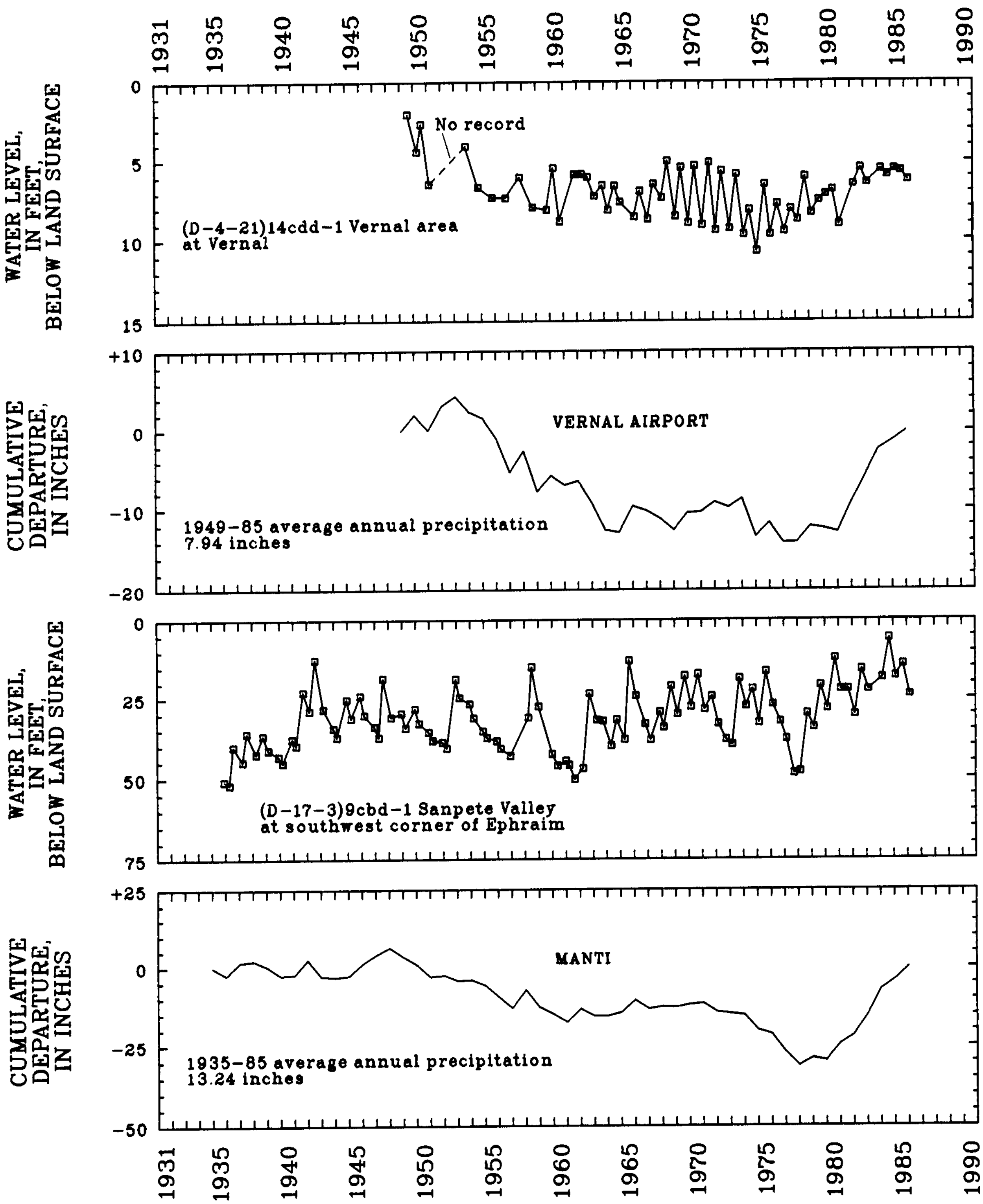
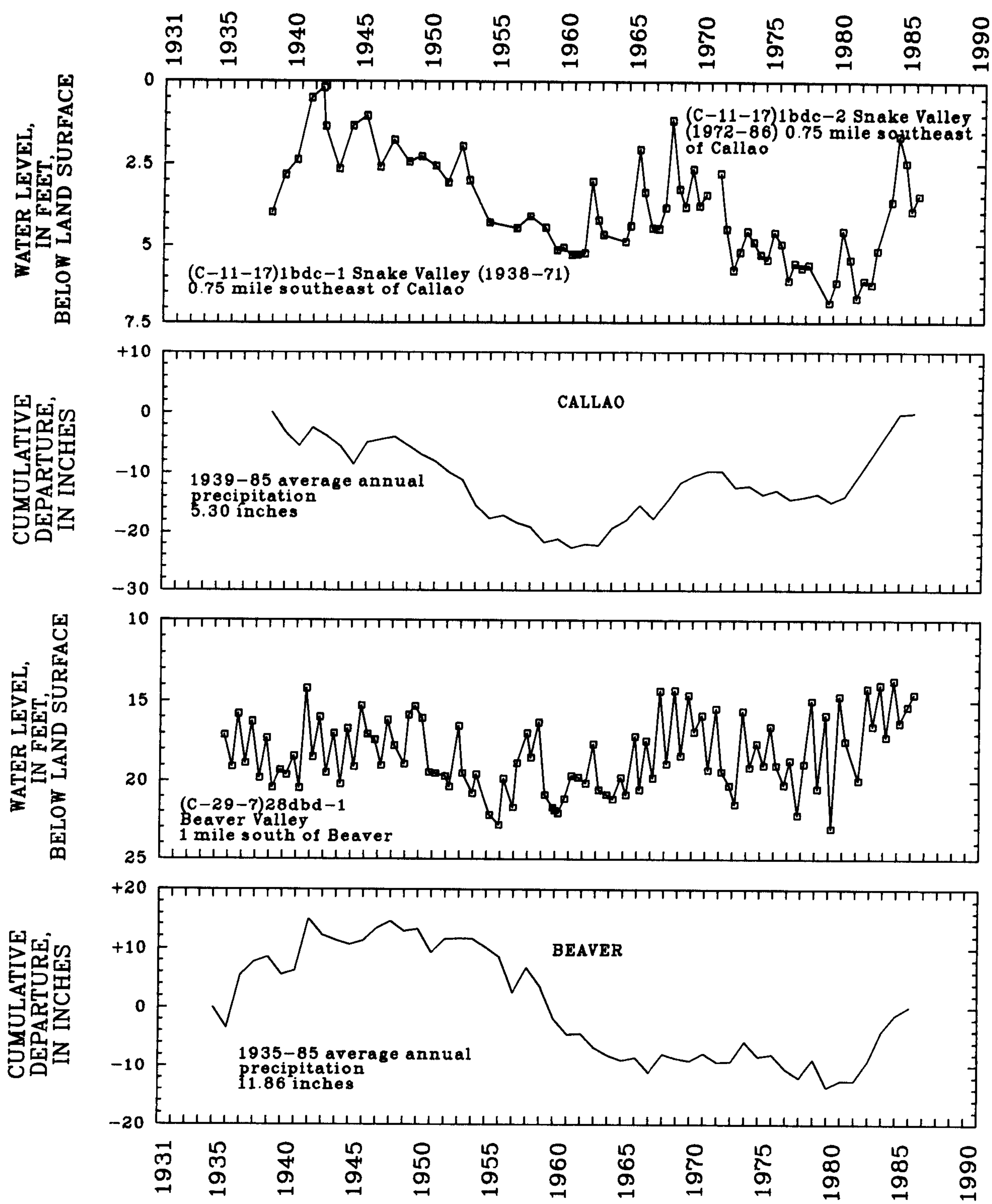


Figure 40.—Continued



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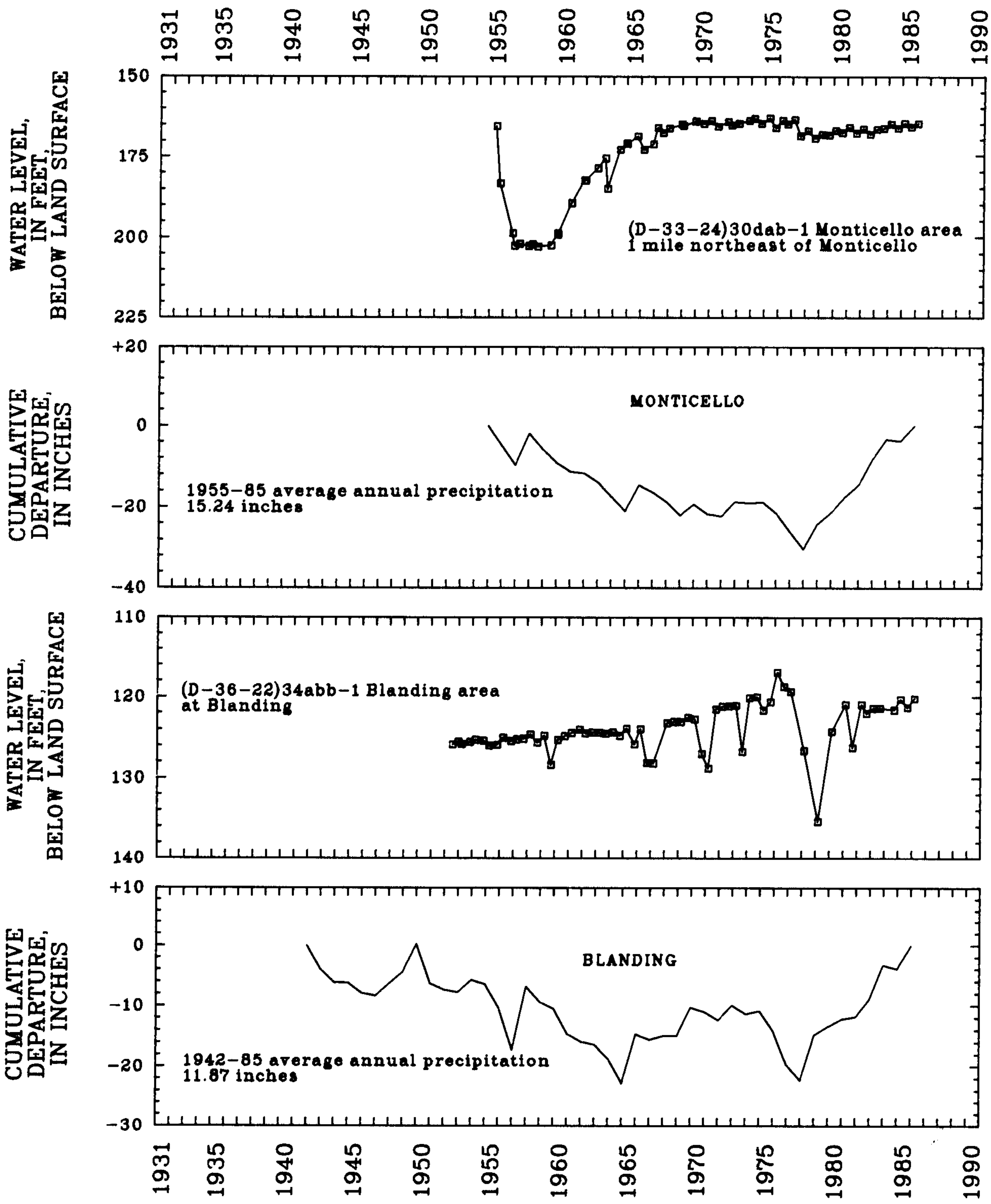

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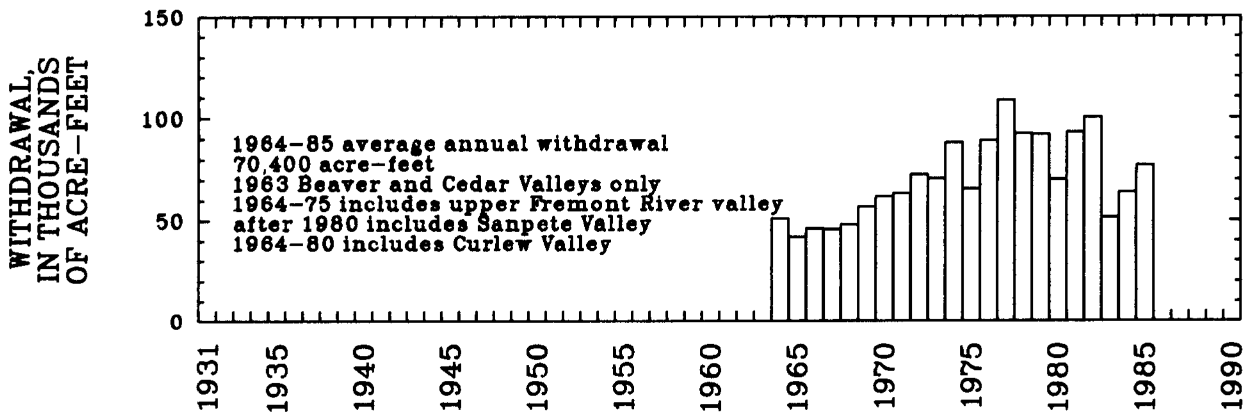

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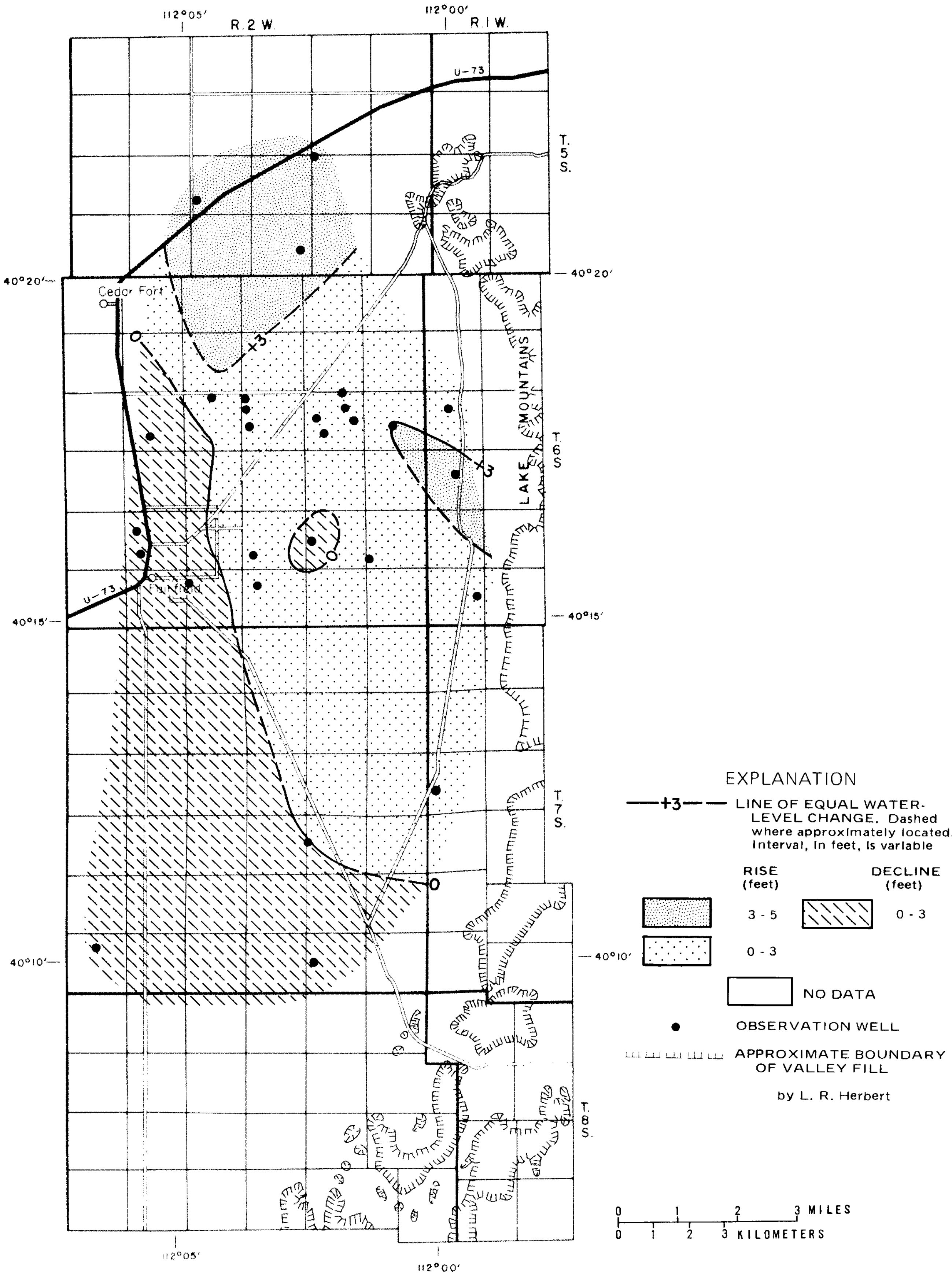

Figure 41.—Map of Cedar Valley showing change of water levels from March 1985 to March 1986.

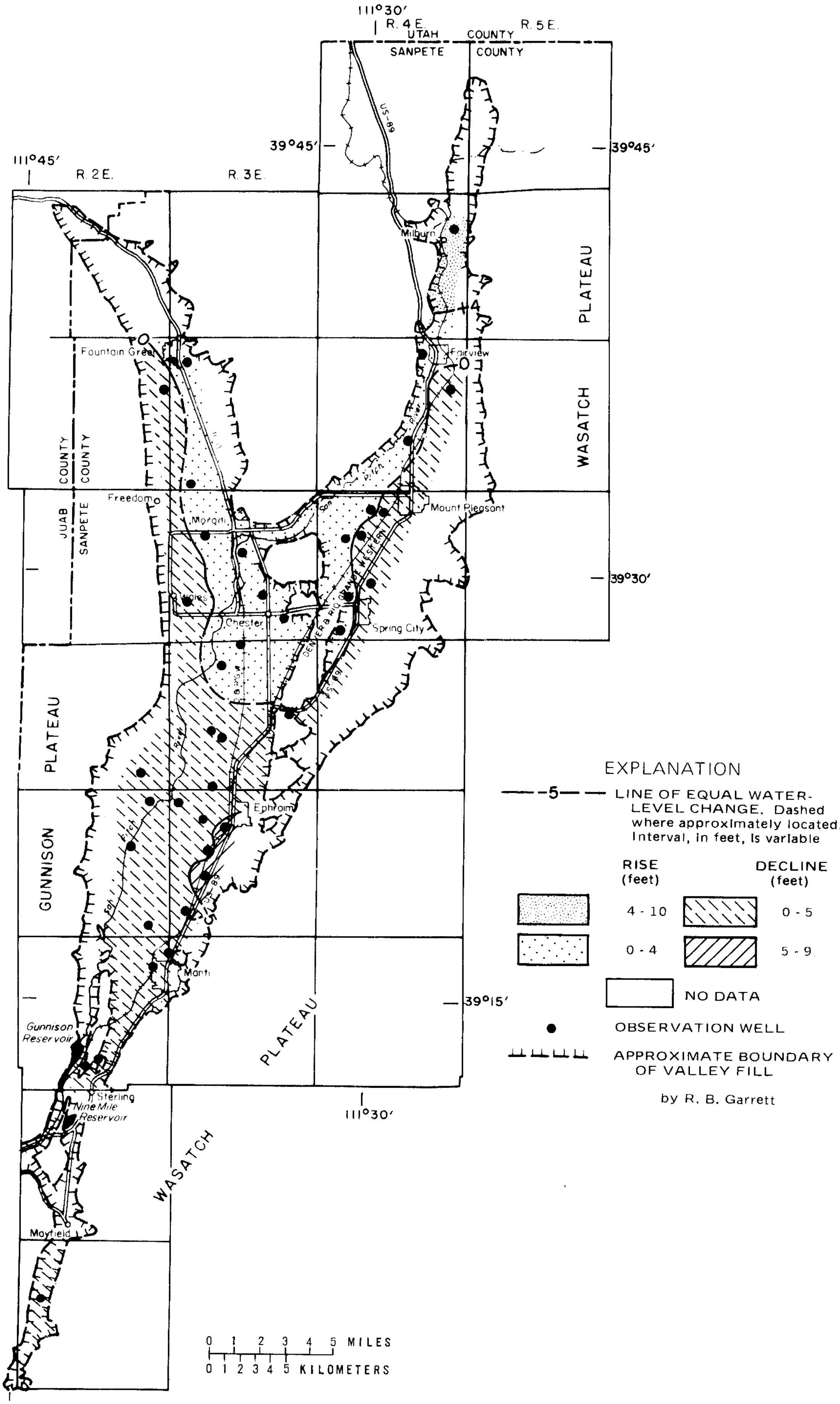

Figure 42.—Map of Sanpete Valley showing change of water levels from March 1985 to March 1986.

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